Master Thesis

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Determinants of organisational social media adoption: The role of innovativeness and sustainability orientation

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Abstract

Experts are convinced that, next to globalisation, economies are about to enter the new era of digitisation which will bring massive and disruptive changes for all economic operators. Use of social media may be considered as a first step to digitisation which has the potential to not only revolutionise communication but also all kinds of interactions between businesses and their major stakeholders. Although the level of engagement varies widely, many companies are already using social media as an important instrument for value creation by managing relationships with consumers and business partners. In light of growing active user numbers and the considerable amount of time internet users spend daily on major social networking platforms, the interest of academia and practitioners in social media is higher than ever before. Current research is focused on business relevance and determinants of social media adoption, with almost exclusive use of large multinational companies listed in leading global stock indices as study subjects. While published literature has utilised technology and innovation adoption theories for explaining differences in adoption, the present study extends this approach by drawing on ideas of stakeholder theory in explaining not only adoption but also success in social media. Specifically, the roles of firm innovativeness and corporate sustainability orientation on social media adoption were examined, using a SEM-PLS approach. Firm innovativeness was found to be a significant predictor of the speed of social media adoption, while sustainability orientation determines the scope and success in online social networks. Implications for practice and theory were discussed. The proposed structural model appears to be promising although some opportunities for improvement were identified.

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1. Introduction

In 2017, internet users globally spent on average 135 minutes per day on social networking sites (GlobalWebIndex, 2017). The active monthly user base of Facebook, the world's leading social network, comprises almost two billion users, surpassing the total population of China (Taylor, 2016) and the number of YouTube users at 1.5 billion (Shinal, 2017) is similarly impressive. These dimensions clearly indicate the power of social media (SM) and explain the increasing interest by researchers from different scientific disciplines, including social sciences, information technology and economics. Enabled by advanced digital technologies, SM has revolutionised the way in which individuals, communities and organisations communicate and has shaped the manner in which different stakeholders interact with each other (Ngai, Tao & Moon, 2015). Prior research on the use of SM by corporations mainly stems from the marketing field, revolving around the role of SM in customer relationship management and customer communication (e.g. Mangold & Faulds, 2009; Hanna, Rohm & Crittenden, 2011), and the marketing-finance arena, being primarily concerned with the effects of SM usage on firms' financial performance and firm value creation (e.g. Culnan, McHugh & Zubillaga, 2010; Paniagua & Sapena, 2014). From a strategic marketing perspective, SM has led to a shift from the one-to-many marketing promotion model to one-to-one mass customisation, enabling consumers to change their passive role into an active co-creator role (Ngai, Moon, Lam, Chin & Tao, 2015). As a result, SM has also enabled businesses to improve key business processes, for example through collaborative product development (Mangold & Faulds, 2009). While consumers might be the most important interest group for consumer brands in that respect, there are several other relevant stakeholder groups that businesses directly or indirectly interact with through SM platforms. These include, for instance, investors and analysts, non-governmental organisations, economic operators along the supply chain, competitors, governmental bodies and opinion leaders. The notion that SM is not only relevant from a customer relationship

perspective but from a broader stakeholder perspective even further underlines the opportunities that the usage of SM offers to businesses. However, research has shown that a large proportion of companies is yet to adopt such technologies. Zhou et al. (2015), who investigated a large sample of firms, found that only 49 percent of the companies under review use Facebook or Twitter and only 30 percent have adopted both platforms. The use of these platforms by firms may have increased over the last few years. While determinants of SM adoption have not been extensively researched, a number of studies have specifically scrutinised factors which determine the adoption of SM by particular types of organisations. Drawing on the technology acceptance model, perceived usefulness has for instance been found to be a key driver of the adoption and usage of social media by B2B organisations (Siamagka, Christodoulides, Michaelidou & Valvi, 2015). There is also evidence that firm innovativeness can be seen as an important organisational capability with more innovative companies being more open to novel technologies (Siamagka et al., 2015).

The study at hand investigates the role of firm innovativeness as one determinant along with the second determinant of SM adoption, corporate sustainability orientation (SO), following Lee, Oh and Kim (2013) who found a positive relationship between the Fortune 500 companies' Twitter profiles and their CSR ratings. As the sole data source, this study will draw on publicly available information such as annual stakeholder and CSR reports of the sampled companies. Both, firm innovativeness and corporate sustainability focus are expected to be determinants of corporate SM adoption, since highly innovative and sustainability-oriented companies are characterised by a strong stakeholder-focus, which in turn makes them more likely to adopt SM platforms, acknowledging the role of SM as a 'stakeholder-relationship management platform' (Lee et al, 2013, p.791). Adding onto this, companies with high levels of innovativeness and a high SO might perceive it as easier and more useful to adopt and use SM, since they have already established stronger relationships with different stakeholders and thus might be able to create online communities faster. Lastly, companies reporting more

extensively on their innovation and sustainability activities, can draw on these sources in terms of producing relevant online content which stakeholders will engage with and ultimately be more successful in using SM. This raises the question whether firm innovativeness and a firm's sustainability orientation influence 1) the speed of SM adoption, 2) the scope of social media usage and 3) the success of organisational SM practices.

While most existing studies on SM adoption are limited to on one or two platforms, the present study considers four social networks, namely Facebook, Twitter, YouTube and Instagram. These platforms are the most penetrated social networks in terms of active usage, apart from Whatsapp and Facebook Messenger (Reuters, 2017), which are considered private messaging tools, used predominantely for one-to-one communication. What further makes the theoretical contribution of this current study unique is the distinction between three different dimensions of SM usage, namely the speed and scope of adoption and the success of a company's activities on the adopted networks. The model was set up in such a way that the effect of both independent variables, i.e. firm innovativeness and SO, on three dependent variables, i.e. speed, scope and success of social media adoption, is tested at the same time. This allows for finer-grained results compared to approaches that consider one dependent variable only.

By finding evidence for a positive relationship between one or both of the independent variables and corporate SM adoption, insights into companies' objectives for engaging in such technologies could be extended beyond the technology-acceptance model and the resource-based view as underlying theories. In terms of theoretical contributions, investigating potential determinants of SM adoption is highly relevant, because it complements the findings of the Marketing-Finance literature examining the relationship between SM usage and firm performance. Moreover, contemplating the success of SM usage seems particularly interesting, since achieving and maintaining high numbers of followers requires companies to address stakeholders in the right way and truly build communities online (Culnan et al., 2010). This in turn is likely to be related to their innovativeness and SO, which are assumed to reflect a firm's

stakeholder focus. The aim of the present study is further to establish SM as an area of research within the strategy field, considering that the relationships of firm innovativeness and SO with social media usage are of strategic relevance to businesses. Finally, this study contributes to existing research in a novel way, since the sample, i.e. the 50 German MDax corporations, represents a study universe that has not been explored by prior studies in the field.

The remainder of this thesis is structured as follows. In section 2 an extensive literature review is conducted, encompassing various research fields including Marketing, Marketing-Finance and Information Technology. Based on this comprehensive analysis, the specific research problem is outlined and hypotheses are being developed. Section 3 comprises a detailed description of the research design and the methodological approach. In the subsequent section, the results are being presented both in terms of test sample description and analysis of the statistical results of model and hypothesis testing. In section 5 these results are being discussed, theoretical and practical implications outlined and finally, the limitations of the study as well as future research directions are being pointed out.

2. Theoretical Background

2.1 Literature Review

The following section provides a structured overview of the existing literature on social media by first describing how SM is commonly being conceptualised, and outlining different theories that underpin the SM phenomenon as well as different related technologies and tools. Subsequently, the relevance of SM for businesses is demonstrated by categorising the literature on corporate SM usage into different streams (cf. **Table 1**). Within these literature streams, a further classification is made, using a concept-centric approach as suggested by Webster and Watson (2002). The last part of this review depicts the determinants of SM adoption that have been discussed in prior literature. **Table 2** lists existing studies that have investigated determining factors for corporate SM usage, presenting the main findings of each study.

2.1.1 Conceptualisation of social media

Although the early roots of social media trace back as far as 1970, when two scientists from Duke University developed the *Usenet*, a distributed system that allowed users to publicly post messages and discuss with other users, SM as we know it today arose around 20 years later. Furthermore, broad adoption of the concept only started as high-speed internet became available on a wider scale. While its general underlying idea might still be closely related to the initial intention of the World Wide Web, i.e. information exchange between users, it is the technological advancements of the past two decades that made SM what it is today (Kaplan & Haenlein, 2010). Several definitions of the term social media can be found in the literature. Mangold and Faulds (2009) for example stated that 'social media is [. . .] a hybrid in that it springs from mixed technology and media origins that enable instantaneous, real-time communication, and utilises multi-media formats (audio and visual presentations) and numerous delivery platforms . . . with global reach capabilities' (p. 359). What the above mentioned and other definitions of the term have in common, is the acknowledgement of internet-based technologies as the foundation of SM and multifaceted interactions among users as its global purpose (Ngai, Moon et al., 2015). Kaplan and Haenlein (2010) further delineated the term social media from two connected concepts, i.e. *Web 2.0* and *User Generated Content*. Web 2.0 relates to the World Wide Web being used as a platform that allows for continuous collaborative modification of content, going beyond content publishing by single actors. User Generated Content, on the other hand, can be viewed as an umbrella term for publicly accessible media content that has been produced by end-users. Putting these different concepts into perspective, the authors defined SM as 'a group of internet-based applications that build on the ideological and technological foundations of Web 2.0, and that allow the creation and exchange of User Generated Content' (Kaplan & Haenlein, 2010, p.61).

In an attempt to gain a better understanding of SM, various authors grouped such media into categories according to different classification schemes. Ngai, Moon et al. (2015), for instance, used *level of interaction* as a grouping variable and divided SM into six different classes respectively. According to the authors, media sharing sites such as *YouTube* and *Instagram* are the SM tools with the weakest level of interaction, followed by blogs and microblogs such as *Twitter*, social bookmarking sites, virtual online communities, social networking sites such as *Facebook*, and finally, virtual worlds. Treem and Leonardi (2013) took on an affordance approach and suggested categorising SM technologies into wikis, social networking sites, blogs, social tagging and microblogging technologies, according to the extent to which their features afford visibility, editability, persistence and association. Following a similar approach, Kietzmann, Hermkens, McCarthy and Silvestre (2011) identified seven functional building blocks of SM and argued that different 'social media activities are defined by the extent to which they focus on some or all of these blocks' (p.241). Kaplan and Haenlein (2010) further proposed to classify SM by the degree of social presence, which is closely related to media richness on the one hand, and the degree of self-presentation or self-disclosure on the other hand. According to this scheme, collaborative projects such as wikis would e.g. have a low degree of social presence or media richness, and a low degree of self-disclosure. Social networking sites on the other hand are characterised by a high degree of self-presentation or self-disclosure and a medium degree of media richness, considering that virtual worlds such as *Second Life* are even higher in media richness and the level of social influence that users have on each other's behaviour (Kaplan & Haenlein, 2010).

While the aforementioned categorisations are based on technical features of SM applications and rather consider SM usage from the perspective of individual users, other approaches focus on organisational users and are more practical in nature (Schlagwein & Hu, 2016). Various scholars (e.g., Ngai, Moon et al., 2015; Turban, Bolloju & Liang, 2011; Andriole, 2010) suggested contemplating different business purposes of SM usage such as

information sharing, communication, training and learning, as well as collaboration and innovation. On the basis of these findings, Schlagwein and Hu (2016) distinguished four different use types, i.e. *broadcast*, *dialogue*, *knowledge management* and *sociability*. Tiago and Veríssimo (2014) developed a typology of firm engagement in digital media which includes but is not limited to social media. Based on 'digital marketing usage' and 'perceived benefits' as dimensional variables, the authors clustered firms into four different user types of digital media, namely digital laggards, digital learners, digital users and interactive users. They further concluded that companies must use 'social media as a channel of providing information to customers, connecting with stakeholders, and, ultimately, generating sales' (Tiago & Veríssimo, 2014, p.708).

2.1.2 Relevance of social media for businesses

Corresponding to the above mentioned diverse business purposes of social media use, different literature streams have emerged, integrating SM theory with the findings from various pre-existing research areas in the business field. **Table 1** summarises these different literature streams and further clusters existing academic articles into subcategories, based on theories and concepts they relate to. This overview makes no claim to be exhaustive but instead focuses on those articles emphasising the firm perspective of SM usage rather than the theory underlying the SM behaviour of individuals. The literature overview further covers those areas that are deemed to be important as a basis for the remainder of this thesis.

As pointed out in the previous section, there are different ways of classifying social media and SM use types. Following up on Tiago and Veríssimo (2014), the comprehensive literature review conducted has shown that SM is not only relevant to businesses from a Marketing perspective, but also plays a crucial role in organisational management as well as in

Table 1. Literature on Social Media in the Business Context

Literature Stream	Related concepts	Articles
Marketing	Marketing Management and Marketing Strategy	Mangold & Faulds (2009), Weinberg & Pehlivan (2011), Berthon, Pitt, Plangger & Shapiro (2012)
	Social Media Metrics	Barger & Labrecque (2013), Peters, Chen, Kaplan, Ognibeni & Pauwels (2013), Drell & Davis (2014)
	Electronic Word of Mouth	Chan & Ngai (2011); Jansen, Zhang, Sobel & Chowdury (2009)
	Customer Communications and Customer Relationship Management	Gallaugher & Ransbotham (2010), Trainor (2012), Trainor, Andzulis, Rapp & Agnihotri (2014), Maecker, Barrot & Becker (2016)
	Branding and Brand Management	Barwise & Meehan (2010), Jin (2012), Gensler, Völckner, Liu-Thompkins & Wiertz (2013)
	B2B Marketing	Järvinen, Töllinen, Karjaluoto & Jayawardhena (2012), Brennan & Croft (2012)
Marketing-Finance	Effect of Social Media on Stock Market Performance	Tirunillai & Tellis (2012), Luo, Zhang & Duan (2013), Schniederjans, Cao & Schniederjans (2013), Piñeiro-Chousa, Vizcaíno-González & Pérez-Pico (2017)
	Effect of Social Media on Store Traffic and Sales	Pauwels, Aksehirli & Lackman (2016), Rodriguez, Peterson & Krishnan (2012), Rishika, Kumar, Janakiraman & Bezawada (2013), Kumar, Choi & Greene (2017)
Organisational Management	Enterprise Social Media	Leonardi, Huysman & Steinfield (2013), Kane (2015)
	Knowledge and Innovation Management	Hemsley & Mason (2013), Leonardi (2014), Roberts, Piller & Lüttgens (2016)
	Recruitment and Employer Branding	Henderson & Bowley (2010), Sivertzen, Nilsen & Olafsen (2013)
Stakeholder Communications	Public Relations and Reputation Management	Eyrich, Padman & Sweetser (2008), Ott & Theunissen (2015), Navarro, Moreno & Al-Sumait (2017)
	Corporate Disclosure	Zhou et al. (2015), Mazboudi & Khalil (2017), Yang & Liu (2017)

stakeholder communications. While it is uncontested that companies should incorporate SM into their integrated marketing communications strategy (Mangold & Faulds, 2009), this is particularly challenging to them due to the hybrid role of SM in the promotion mix. On the one hand, social media enables organisations to talk *to* their customers, however, on the other hand, it requires companies to shape the conversations *between* their customers (Mangold & Faulds, 2009).

In this context, academics have coined the term 'electronic word-of-mouth', which refers to statements made by customers online, expressing positive or negative sentiments about a product, company or service (Harrison-Walker, 2001 in Chan & Ngai, 2011). Jansen et al. (2009) specifically investigated the role of microblogging services such as *Twitter* as a form of electronic word-of-mouth. The authors concluded that microblogging is a valuable source of real-time customer feelings for companies, and at the same time offers the opportunity to connect to customers in a timely manner. This, in turn, enables organisations to improve customer relationships and shape brand perceptions (Jansen et al., 2009). Gensler et al. (2013) specifically investigate how SM affects brand management practices and argue that consumers can be viewed as 'authors of brand stories' (p.246) who use a multitude of channels, making it challenging for firms to coordinate these stories. In contrast, Maecker et al. (2016) examined the role of social media in customer relationship management and found that social media interactions have a positive effect on upselling practices and customer retention. Moreover, the authors observed that these benefits exceed the costs incurred by the higher number of service requests reaching companies through social media. Relating these findings back to marketing management, Berthon et al. (2012) emphasised that businesses need to acknowledge both, the opportunities and the challenges of social media and adapt their marketing strategy accordingly. Considering the costs that are generated by engaging in social media activities, a number of academic papers point out the importance of using SM metrics. Barger and Labrecque (2013), for example, provided an overview of common social media marketing metrics, including the

formulas for measures such as engagement and return on investment. Looking at the broader, mid- to long-term impact of SM use, several studies have investigated its effects on firm financial performance. Luo et al. (2013) showed that SM-based metrics are indicators of firm equity value and are stronger predictors than conventional online consumer metrics.

As indicated above, much of the research on SM has focused on the Marketing and the Marketing-Finance arena. However, a growing number of recent studies have been considering the role of social media for organisational management and acknowledge that SM is not only crucial in managing relationships with customers but with a variety of other stakeholders as well. Kane (2015), for example, developed a platform-independent framework for considering the effects that SM has on the enterprise itself. Reflecting on the question how to optimise knowledge management, Hemsley and Mason (2013) suggested that organisations should systematically use SM platforms to create a new knowledge ecosystem. Roberts et al. (2016) argued that companies need a clear SM strategy and have to carefully leverage their new product development practices in order to achieve high innovation performance. Recognizing the importance of social media in communicating with various stakeholders, Zhou et al. (2015) investigated the adoption of two SM platforms, i.e. *Facebook* and *Twitter*, and the degree to which companies use these channels for corporate disclosure purposes. Their results show that more than seven percent of Facebook and more than three percent of Twitter messages are related to corporate disclosures, with the percentage of disclosures on Facebook having increased consistently and disclosures on Twitter having decreased steadily since 2010. Yang and Liu (2017) further found that firms reduce the disclosure of negative information but are active in disseminating positive earnings-related post and thus act opportunistically in disclosing information on social media, striving to create and maintain a favourable public reputation.

In line with this, a number of authors from the Public Relations field have examined the role of SM in external communications. While Eyrich et al. (2008) called attention to the

general importance of social media for public relations practitioners, Navarro et al. (2017) found that many communication professionals lack knowledge about stakeholders' expectations, which can negatively influence firms' reputation and stakeholder trust. This has consequences for firms' SM usage, since listening to stakeholders and understanding their expectations and needs is crucial in effectively managing the dialogue on different platforms. Ott and Theunissen (2015) pointed out that inappropriate strategies can even cause SM crises, which exposes companies to the challenge of dealing with upset stakeholders. The review of these publications emphasises that social media has become an indispensable tool for stakeholder management and ultimately for business success.

2.1.3 Determinants of organisational social media adoption

Considering the various ways in which social media can support business on the one hand, and the challenges that effective SM management poses to companies on the other hand, academics have shown interest in what motivates organisations to adopt SM and what might hinder them in doing so. Most existing research on the determinants of firm social media adoption draws on concepts such as the technology acceptance model (TAM) and innovation adoption theory. The TAM dates back to Davis (1989) who argued that 'perceived usefulness' and 'ease of use' are the two major factors in explaining technology acceptance. Frambach and Schillewaert (2002) provided an analysis of the Marketing and Management literature on organisational innovation adoption, and developed a framework that integrates the TAM with innovation adoption theory. **Table 2** provides an overview of different studies that have scrutinised determining factors and antecedents of SM adoption by organisations. Although not synonymous to social media, studies on the adoption of Web 2.0 technologies are also included in the analysis.

The determinants identified and investigated by different authors can be categorised into three major categories, i.e. 1) 'demographic' features such as company size, industry affiliation, geographic location and financial performance, 2) external factors such as societal culture and

Table 2. Studies on Determinants of Firm Social Media Adoption

Study	Research Focus	Type	Main Finding(s)	Data / Sample
Barnes (2010)	Usage of social media by fast-growing companies	Empirical	The Inc. 500 are found to be more likely to adopt social media and more sophisticated in using SM for stakeholder communications.	Inc. 500 (fastest-growing private companies in the US) and Fortune 500
Raeth, Urbach, Smolnik, Butler & Königs (2010)	Development of a process-theory for Web 2.0 adoption by firms (rollout of corporate wikis and weblog platforms)	Case Study	Adoption of Web 2.0 systems differs from larger enterprise system adoption projects, as Web 2.0 systems are less costly to implement and technically less complex.	Case study material from three companies, differing in size and industry affiliation
Michaelidou, Siamagka & Christodoulides (2011)	Usage, barriers and measurement of social media marketing by B2B SMEs	Empirical	B2B SMEs use social networking sites primarily to cultivate customer relationships. Usage barriers include perceived irrelevance, uncertainty as to the use of SNS to support brands and lack of training among staff.	1000 B2B SMEs in the UK derived from FAME database
Bonsón & Flores (2011)	Use of Web 2.0 technologies and social media by global financial institutions in corporate reporting	Empirical	The adoption of Web 2.0 technologies and social media by financial institutions is influenced by their size and the region in which they operate.	132 main global financial entities in Europe, Asia and the Americas
Saldanha & Krishnan (2012)	Antecedents of Web 2.0 adoption by firms	Empirical	The importance of open standards, firm size and industry knowledge intensity are positively related to the adoption of Web 2.0 technologies.	Survey of US firms conducted by *InformationWeek*
Perrigot, Kacker, Basset & Cliquet (2012)	Early adoption and use of Facebook for stakeholder communications	Empirical	The adoption of Facebook by franchisors is influenced by the number of outlets, the number of company-owned outlets, advertising royalty rates and industry type.	408 franchisors doing business in the French market
Nah & Saxton (2013)	Adoption and use of Twitter and Facebook by non-profit organisations	Empirical	Organisational strategies, capacities, governance features and external pressures determine social media adoption and utilisation outcomes.	100 large US corporations
Lee, Oh & Kim (2013)	Impact of CSR on the effectiveness of social media as a stakeholder-relationship management platform	Empirical	Firms with higher CSR ratings have a clear advantage in leveraging social media due to higher diffusion of stakeholder voices.	222 firms drawn from the Fortune 500

Table 2. Studies on Determinants of Firm Social Media Adoption (continued)

Wamba & Carter (2013)	Twitter adoption and use by SMEs	Empirical	Firm innovativeness, manager's age and firm geographic location impact Twitter adoption.	453 SME managers from the US, UK, Australia and India
Bharati, Zhang & Chaudhury (2014)	The role of absorptive capacity and institutional pressures in social media assimilation	Empirical	Firms' absorptive capacity (learning ability) mediates the influence of institutional pressures on social media assimilation.	300 IT professionals and managers at US companies
Schlagwein & Phrasarnphanich (2014)	Impact of societal culture on organisational social media use	Empirical	Societal culture does impact on the organisational adoption of social media use. In-group collectivism has a positive, and uncertainty avoidance a negative impact on social media use intensity.	Fortune Global 500
Siamagka et al. (2015)	Social media adoption by B2B organisations	Empirical	Perceived usefulness and organisational innovativeness are key factors in determining social media adoption decisions by B2B organisations.	5000 B2B organisations in the UK
Smith, Blazovich & Smith (2015)	Differences in social media adoption in terms of platform, industry, size and financial performance	Empirical	There are differences between industries in terms of platforms adopted. Twitter and Facebook are the most used platforms among manufacturing firms, while Facebook is the most used platform by retailers.	Fortune 500
Uyar & Boyar (2015)	Degree of social media usage by publicly traded firms in Turkey	Empirical	Half of the BIST 100 corporations do not use any social media tool. Technology, service and financial firms are more inclined to use social media than manufacturing firms.	Firms listed on the BIST 100
He, Wang, Chen & Zha (2017)	Adoption of social media by small non-manufacturing businesses	Case Study	The decision of small businesses to adopt social media is influenced by the perception of social media (usefulness, ease of use), personal characteristics of business owners, social influence (peer pressure, media), current business performance and business purposes (such as marketing and CRM).	27 businesses in a mid-size US city

competitive pressures, and 3) internal factors such as absorptive capacity, innovativeness, institutional pressures and corporate social responsibility activities. Bonsón and Flores (2011), Saldanha and Krishnan (2012) and Perrigot et al. (2012) all found a relationship between company size and the adoption of Web 2.0 technologies or social media, respectively. The fact that a few studies, including Michaelidou et al. (2011), Wamba and Carter (2013) and He et al. (2017) specifically focused on SM usage by small and medium enterprises further underlines that firm size seems to play an important role in the adoption of such technologies. Similarly, several studies show that industry (e.g. Smith et al., 2015; Uyar & Boyar, 2015), geographic location (e.g. Bonsón & Flores, 2011; Wamba & Carter 2013) and financial performance (Barnes, 2010) have an influence on SM adoption decisions by firms. Other authors provided evidence for specific external factors such as societal culture (Schlagwein & Phrasarnphanich, 2014) and competitive pressures (Nah & Saxton, 2013) to have an effect on adoption.

As mentioned above, in studying the adoption of SM from an internal perspective, academics draw on the technology acceptance literature (e.g. Nah & Saxton, 2013; Siamagka et al., 2015; Raeth et al., 2010). However, Web 2.0 technologies differ from other technologies in that they have lower implementation and maintenance costs, and are technically less complex than other enterprise systems (Raeth et al., 2010). This might weaken the importance of the TAM for social media adoption; nevertheless, perceived usefulness seems to be an important criterion for firms in deciding whether to adopt social media (Siamagka et al., 2015). Furthermore, research suggests that companies need to develop 'absorptive capacity' in order to be able 'to recognise and acquire new knowledge and to subsequently . . . exploit any knowledge provided by their customers' (Culnan et al., 2010, p. 249). Following up on this, Bharati et al. (2014) found that absorptive capacity, i.e. an ability to learn and integrate new with existing technologies, mediates the relationship between institutional pressures and SM assimilation. This implies that the pressure coming from competitors, customers, and vendors leads companies to build absorptive capacity, which in turn influences SM adoption (Bharati et

al., 2014). Siamagka et al. (2015) drew on the resource-based view of the firm and argue that organisational innovativeness is a critical resource in supporting technology adoption. Other authors (Michaelidou et al., 2011; Wamba & Carter, 2013) also confirmed that innovativeness affects SM adoption decisions. Considering not only the adoption but the effectiveness of firm social media usage, Lee et al. (2013) found that firms' CSR ratings are an indicator of faster and more successful adoption of SM. Specifically, the authors focused on one social media platform, i.e. Twitter, and show that a firm's CSR rating predicts the number of followers, the number of replies and mentions, and the number of retweets. They claimed that SM works as a platform that embodies ethical capital, i.e. sustainable positive relationships with stakeholders and that the benefits of these relationships become more obvious through social media.

In brief, considering the still rather nascent stage of social media research, there exists a considerable amount of literature on the determinants of SM adoption. However, the majority of studies focused on only one or two SM platforms and solely looked at whether a company has adopted certain media without considering the intensity with which they are using them. Based on the above literature, the current study therefore develops a model that examines the determinants of three different facets of SM usage by firms: 1) speed of adoption, 2) scope of adoption and 3) success of social media usage, considering four major SM channels.

2.2 Research question and hypotheses

To contribute to a better understanding of the determinants of social media adoption and the factors affecting the success of such practices, the current study focuses on firm-specific, internal factors. Specifically, the study at hand considers two concepts identified from the above discussed literature that appear particularly relevant from a strategic perspective. Firstly, the role of firm innovativeness in determining the adoption and the success of SM practices is being examined, following up on previous studies (Michaelidou et al., 2011; Wamba & Carter, 2013; Bharati et al., 2014). These authors mostly based their reasoning on the above-mentioned

resource-based view, suggesting that firm innovativeness, as an organisational capability, positively influences the adoption of SM activities. One implication of this is that more innovative firms will be early adopters of social media compared to less innovative firms (Michaelidou et al., 2011). In addition, 'an innovative climate within organisations . . . cultivates specialised knowledge, and . . . serves to increase the organisations' capabilities' (Siamagka et al., 2015, p.91-92). It follows from this, that more innovative companies are better at developing social media competence, and can therefore be expected to have a higher level of activity and be more successful in terms of building communities online. Therefore, this study hypothesises the following:

Hypothesis 1a: *Firm innovativeness will determine the speed of SM adoption.*

Hypothesis 1b: *Firm innovativeness will determine the scope of SM usage.*

Hypothesis 1c: *Firm innovativeness will determine the success of SM usage.*

While fully acknowledging the role of firm resources and capabilities in adopting and successfully engaging in SM, the present study further recognises the importance of stakeholder co-creation in innovation processes that is increasingly being stressed by academics (e.g. Kazadi, Lievens & Mahr, 2016). Therefore, for the purpose of this study, the definition of firm innovativeness also incorporates aspects such as open innovation practices which indicate that firms actively involve external stakeholders.

Drawing on stakeholder theory and adopting a 'managing for stakeholders view' (Freeman, Wicks & Harrison, 2007, p.6), the current study further investigates the influence of firm sustainability orientation (SO) on social media adoption and usage outcomes. In using this term, it follows the rationale of Du, Yalcinkaya and Bstieler (2016), who scrutinised the effect of SO on new product development. Bearing in mind the above discussed opportunities and risks associated with social media adoption and use, Lee et al. (2013) contended that firms'

assessment of these risks will vary according to their level of social responsibility. As more socially responsible firms tend to view stakeholders as supporters of their business rather than a potential source of negative criticism, these organisations will perceive it as less risky to adopt SM. Although information control is not fully in the hands of companies anymore (Mangold & Faulds, 2009), firms that put a lot of effort into managing stakeholder relationships and have sustainability rooted in their business strategy, can be expected to be more confident about using SM. Therefore, this study proposes the following:

Hypothesis 2a: *Firms' sustainability orientation will determine the speed of SM adoption.*

Considering that the dialogue with stakeholders is at the core of the stakeholder management perspective and that it 'enhances public support, image, and reputation' (Lee at al., 2013, p.795), socially responsible firms are more likely to initiate dialogue with stakeholders through SM (Lee et al., 2013). Going even beyond that, firms with a high sustainability orientation include various stakeholder- and sustainability-related considerations in their business operations (Du et al., 2016). As a consequence, they are expected to actively seek exchange and conversation with different stakeholders. Hence, the following is proposed:

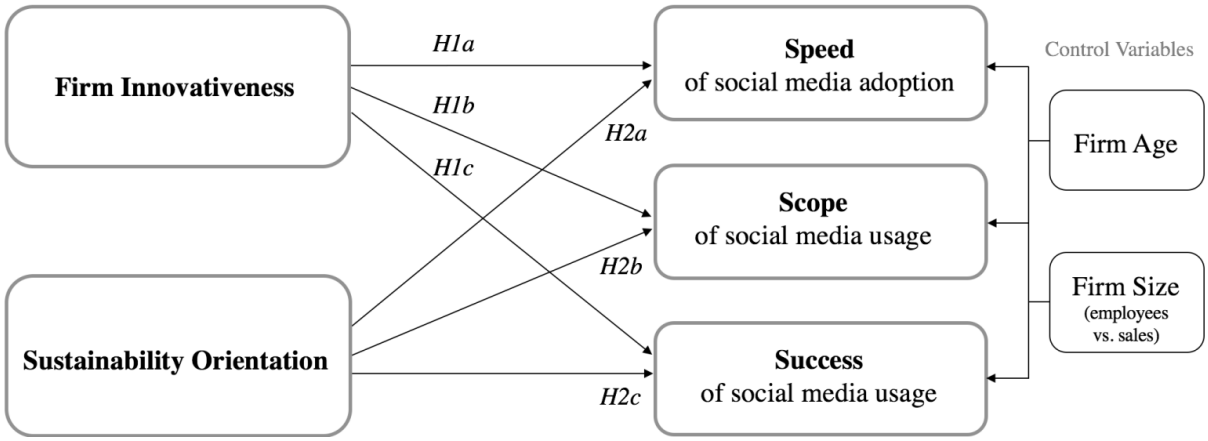
Hypothesis 2b: *Firms' sustainability orientation will determine the scope of SM usage.*

As shown by Mozas-Moral, Bernal-Jurado, Medina-Viruel and Fernández-Uclés (2016), the intensity of a firms' social network activity has an influence on their ability to attract a high number of followers. However, as Kaplan and Haenlein (2010) indicated, companies need to produce relevant content that meets stakeholders' expectations and engages them in order to be successful in SM. Those firms with higher levels of sustainability orientation have stronger relationships with their stakeholders (Lee et al., 2013) and better knowledge of their interests, which will enable them to build popularity on SM through providing stakeholder-relevant content. Therefore, the following is hypothesised:

Hypothesis 2c: *Firms' Sustainability Orientation will determine the success of SM usage.*

The conceptual model shown in Figure 1 summarises the above theorised basic relationships.

Figure 1. Conceptual Model



The present study focuses on the role of two internal factors, namely firm innovativeness and sustainability orientation, as determinants of SM adoption. However, both, firm innovativeness and sustainability orientation are assumed to not only reflect a company's internal culture and strategy, but to also be influenced by external factors such as competitive and political pressures. Therefore, the proposed model does not only consider internal factors but indirectly also accounts for external determinants, which are perceived differently by companies and result in different strategic reactions. While two demographic factors, namely firm age and firm size are being used as control variables, other demographic factors that were found to play a role for SM adoption are not being considered in detail here. For instance, it does not seem reasonable to consider geographic location as a determinant, since the sample only includes German corporations. Due to sample size restrictions and unequal distribution of companies across sectors, industry affiliation is not being included as an explanatory factor in the model.

3. Method

The following chapter outlines the methodology that has been applied in answering the research question and testing the above-stated hypotheses. At first, the sample and data collection process are depicted. Subsequently a detailed description of the measures used in this study is provided (cf. **Table 4**) and finally, the data analysis method is explained.

3.1 Sample and Data Collection

The unit of data collection studied in this research is a firm. Whereas most of the existing research on determinants of corporate social media use focuses on the North American market and on big well-known companies such as the Fortune 500, the current study investigates into a rather under-researched area, namely a particular category of German shareholder companies. Specifically, this research studies SM adoption and use by the 50 MDAX listed companies, i.e. those that rank below corporations listed on the DAX in terms of market capitalisation and exchange turnover (Deutsche Börse AG, 2004). This sample is of particular interest as it comprises companies from different sectors, including service providers as well as manufacturers of consumer goods and industrial products. Since the current study draws on the notion of SM as not only a customer but a *stakeholder* relationship management tool, the MDAX appears to be a well-suited sample which includes the most important sectors of the German economy. Furthermore, MDAX listed companies are obliged to fulfil defined reporting requirements and publish quarterly reports (Wirtz & Salzer, 2013). This allows for direct extraction of relevant data on firm demographics as well as innovation-related data such as R&D expenditure. Whereas reporting on sustainability practices is not mandatory, 46 percent of MDAX companies have published some kind of sustainability report already in 2014, although with varying scope and quality (Ernst & Young, 2014). At the time of data acquisition for this research, almost all companies in the sample published information on their sustainability activities in one or the other way.

In examining firm innovativeness and sustainability orientation, this study draws on different publicly available data sources, following a mixed methods approach. Quantitative data such as R&D expenditure and the number of patent applications was extracted from corporate reports and websites, as well as from public databases such as the patent database of the German trademark and patent office (DMPA). In the absence of an independent CSR rating for the entire sample, a qualitative assessment of companies' annual and sustainability reports was undertaken in order to determine their sustainability orientation. Based on the extracted information, the quality and depth of companies' sustainability efforts was rated on a five-point scale according to pre-defined assessment criteria. A more detailed description of the variables and how they were operationalised in the context of this study follows in the next section.

The social media data, including the number of posts published by companies and the number of followers, were mostly collected from the company profiles on the SM platforms included in this study, i.e. Facebook, Twitter, Instagram and YouTube. In case that a company had several profiles on any of the SM platforms under review, the account with the highest number of followers and likes was taken. For more detailed Twitter and Facebook data, two online analytics tools, *twitonomy.com* and *sociography.io*, were used. To avoid bias in social media data, the figures for all fifty companies were collected on a specified date per channel.

A full list of the firms listed on the MDAX at the time of data collection as well as the raw data can be found in the Appendix (**Appendices 1 and 2**).

3.2 Measures

3.2.1 Independent Variables

The two independent variables included in this study are firm innovativeness and corporate sustainability orientation. In measuring firm innovativeness, a number of different approaches have been used in past literature. With a view to social media adoption, some researchers define innovativeness as an organisational climate which 'fosters new technologies and cultivates

specialised knowledge, and which serves to increase the organisation's capabilities' (Siamagka et al., 2015, pp.91-92). In contrast, researchers targeting at the association between SM adoption and economic performance used more traditional measures of innovation such as the R&D/sales ratio, the number of patents and the number of new products developed (e.g. Mackelprang, Habermann & Swink, 2015; Alexiev, Volberda & Van den Bosch, 2016). While especially relevant from a financial performance perspective, innovation output, i.e. the number of new products or services developed is not being considered here, since the primary interest of this study is the influence of firms' innovation *efforts* and *capabilities* on the adoption of SM. Besides traditional measures of innovation, i.e. the R&D/sales ratio and the number of patent applications, this study includes an additional innovativeness measure, reflecting the degree to which a firm collaborates with external stakeholders. This contrasts prior studies which limit innovation measures either to input (e.g., Tsai & Yang, 2013; Dibrell, Craig & Neubaum, 2014) or output (e.g., Alexiev et al., 2016). In brief, this study looks at firm innovativeness as an organisational capability rather than as an outcome of innovation activities. Collaborative innovation efforts were measured by consolidating three dummy variables, i.e. *engagement in open innovation*, *collaboration with start-ups* and *presence of innovation hub*, into one measure. In determining whether a company fulfils the respective criterion, corporate reports, company websites and online public news coverage were considered. The dummy variables were coded 0 (not existing) and 1 (existing), and a composed measure was created, ranking cases on a scale of 1 (one criterion fulfilled) to 3 (all criteria fulfilled). The R&D/sales ratio was calculated using the figures stated in the 2015/2016 annual reports of the sampled companies and the number of patent applications in 2015 (most recent data available) was extracted from the DPMA online database, using the advanced search option. Due to different fiscal years, the 2015/2016 or 2016 annual reports were used respectively.

The present study draws on prior literature (Crittenden, Crittenden, Ferrell, Ferrell & Pinney, 2011; Roxas & Coetzer, 2012; Adams et al., 2016; Claudy, Peterson & Pagell, 2016)

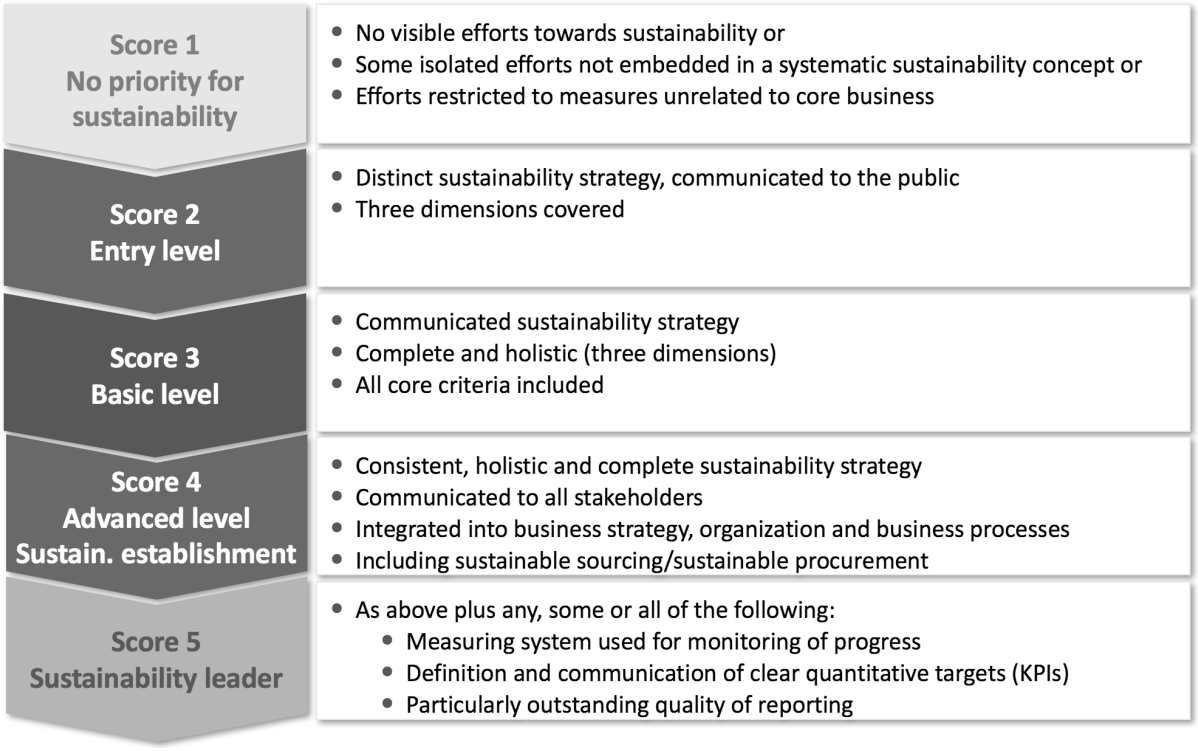
in using the term *sustainability orientation*. Roxas and Coetzer (2012) defined SO as 'a business orientation that reflects the firm's philosophy of doing business in an environmentally [and socially] sustainable way'. They further stated that this is manifested in companies integrating environmental and social considerations into their culture, strategy and business operations as well as into their stakeholder interactions. Building on the assumption, that providing the most comprehensive, transparent picture of their sustainability efforts is of vital interest for any company, this study presumes that the quality and depth of a firm's sustainability reporting reflects its SO in a fairly precise way. For a semi-quantitative assessment of each company's sustainability orientation, the criteria and dimensions as applied for the Dow Jones Sustainability Index (DJSI) were used (cf. **Table 3**; RobecoSAM, 2017).

Table 3. Assessment Criteria for Sustainability Orientation (Adapted from RobecoSAM, 2017)

Dimension	Core Criteria	Additional Criteria
Economy	Codes of Business Conduct Corporate Governance Materiality Risk & Crisis Management	Anti-crime policy measures Customer Relationship Management Financial Stability and Systemic Risk Information Security & Cybersecurity Innovation Management Market Opportunities Marketing Practices Product Quality and Recall Management Supply Chain Management Tax Strategy
Ecology (Environment)	Environmental Policy & Management Systems Environmental Reporting	Biodiversity Business Risk and Opportunities Climate Strategy Electricity Generation Operational Eco-Efficiency Transmission & Distribution Water-Related Risks
Society	Corporate Citizenship & Philanthropy Human Capital Development Labour Practices Indicators & Human Rights Social Reporting Talent Attraction/Retention	Addressing Cost Burden Controversial Issues, Dilemmas in Lending & Financing Financial Inclusion Health Outcome Distribution Stakeholder Engagement Strategy to Improve Access to Drugs or Products

In contrast to DJSI's assessment process which is based on the companies' detailed responses to comprehensive questionnaires, this study used exclusively publicly available information. Thus, a semi-quantitative concept was applied for operationalisation of the extracted information to reveal a score on a scale of 1 to 5 as illustrated in **Figure 2**.

Figure 2. Concept Used for Operationalisation of Sustainability Orientation Criteria



In recognition of the limited precision level intrinsic to this approach, a supplementary bonus-malus system was applied to account for possible additional elements of a sustainability strategy and/or its implementation. Examples are commitment of top management (executive board) to sustainability targets, external recognition in the form of sustainability awards, top scores on rank lists quoted by independent organisations, engagement as front-runners in improving stakeholder dialogue, employment of scientific tools related to sustainability or external certifications of a firm's sustainability strategy and achievements.

3.2.2 Dependent Variables

Three different dependent variables were included in the conceptual model of this study, which each represent a distinct dimension of social media usage. First, the *speed* of SM adoption was measured by calculating a ratio (years) between duration of use of a channel and the period for which this channel has been existing. The closer this ratio is to one, the earlier a company has adopted a particular SM channel. The measure used in the present study is based on the simpler approach published by Lee et al. (2013), which was upgraded by utilisation of a ratio allowing for better comparison and for the consolidation of data for multiple channels.

The second dependent variable is *scope* of social media usage as measured by several indicators that refer to a firm's level of activity on a platform. First, the number of channels (maximally 4) adopted by a firm was included, with Twitter, Facebook, YouTube and Instagram being considered. Furthermore, the amount of posts and – in the case of YouTube – the total number of videos published, a metric that Peters et al. (2013) have referred to as content volume, was taken into account.

The third dependent variable considered in this study is *success* of SM usage. In operationalizing success in online social networks, this study builds on Mozas-Moral et al. (2016) who used the number of followers as a measure for success. However, the current study extended this measure by additionally including indicators of the level of user interaction, which is regarded as an important success criterion. Channel-specific metrics are dependent on the individual channel's nature and functionality. In the case of Twitter, the number of followers and likes as well as the number of retweets (shares of a company's posts) and hashtags (label used to refer a post to a topic or actor of public interest) was taken. Considering Facebook, the number of followers and likes as well as the number of reactions, comments and shares per post was collected, using *sociograph.io*, a Facebook analytics tool. While for Instagram the number of followers was included due to the non-availability of an appropriate analytics tool, with

respect to YouTube, the number of total views as well as the number of subscribers was taken into account.

3.3.3 Control Variables

Two control variables were included in the statistical model in order to account for the effects of demographic firm characteristics that have been found to have an influence on social media adoption by prior studies. First, it was controlled for *firm age*, following Lee et al. (2013) and Bharati et al. (2014) who both showed that a company's age is positively related with early adoption as well as with variables related to the scope and success of SM as defined by this study. Nevertheless, it should be noted here that, as pointed out by Mozas-Moral et al. (2016), there exists a lack of consensus on the relationship between firm age and the innovative attitude of a company. Furthermore, Mozas-Moral et al.'s results refute the hypothesis that firm age facilitates the adoption and use of SM, which they assume to be due to the easy access, the ease of use and the low costs of using such technologies. In light of this, the inclusion of firm age into the model appears to be interesting for the purpose of testing the existence and direction of the relationship. Firm age was measured as the number of years since a company was founded.

The second control variable taken into account is *firm size*, building on a number of prior studies, including e.g., Smith et al. (2015) who found that firm size has a positive effect on the number of SM platforms adopted. This might be due to the fact that larger organisations have more resources, greater slack and economies of scale in terms of adopting such technologies (Saldanha & Krishnan, 2012). As Frambach and Schillewaert (2002) argued, larger firms might feel greater pressure to adopt new technologies to improve their performance. In measuring firm size, this study draws upon Lee et al. (2013), Siamagka et al. (2015) and Smith et al. (2015), using sales as a proxy for firm size. To check for robustness, separate models were run, using the number of employees, which is another widely used measure of firm size (Lee & Xia, 2006), as a proxy. **Table 4** provides an overview of the

measures used for each variable and shows which prior studies have utilised similar measures or served as a basis for the development of the measures used in this study.

Table 4. Overview of Measures

Variable	Measure(s)	Studies
Firm innovativeness	R&D/Sales Ratio	Parthasarthy & Hammond (2002); Mackelprang et al. (2015)
	Patent Citations	Mackelprang et al. (2015); Tellis, Prabhu & Chandy (2009)
	Collaboration with external partners (Engagement in open innovation; Cooperation with start-ups, Innovation lab)	Michelino, Lamberti, Cammarano, Caputo (2015); Alexiev et al. (2016)
Sustainability Orientation	Sustainability Rating (1-5)	Claudy et al. 2016); RobecoSAM (2017)
Speed of social media adoption	Number of years a channel has been used (Ratio)	Lee et al. (2013); Mozas-Moral (2016)
Scope of social media usage	Number of channels adopted	Schlagwein & Prasarnphanich (2014); Smith et al. (2015)
	Number of posts	Nah & Saxton (2013)
Success of social media usage	Number of likes	Barger & Labrecque (2013); Oh, Roumani, Nwankpa & Hu (2017)
	Number of followers/subscribers Number of comments, shares, reactions	Michaelidou et al. (2011); Mozas-Moral (2016)

3.3 Data Analysis Method

The current study uses structural equation modelling (SEM), a combination of factor analysis and multiple regression that allows for testing hypotheses about relationships among theoretical concepts (Moutinho & Huarng, 2016). The partial least square method (PLS) was employed to evaluate both the measurement model and the structural models, using the statistical software package *SmartPLS 3.2.7* (Ringle, Wende & Becker, 2015). While the predominant technique of co-variance based SEM requires the compliance with a number of rules regarding e.g.,

sample size and parametric assumptions, the PLS method has minimal demands on these criteria. More importantly, the application of the PLS method is reasonable within the context of this study, since is well-suited for research problems on which prior theory is limited, as is the case here. In addition to checking hypotheses, the PLS analysis includes model assessment and thus evaluates the model's suitability for prediction of dependent variables. Whereas covariance-based SEM analysis typically requires latent variables to have reflective indicators, the PLS approach allows for testing relationships between formative constructs (Chin & Newsted, 1999). All constructs included in this study were identified as formative, meaning that 'indicators are viewed as causing rather than being caused by the latent variable' (Chin & Newsted, 1999, p.310). Since all indicators are manifestations of their unobservable constructs, the constructs included in the model are first-order constructs (cf. Ping, 2002).

The validity of formative constructs was assessed at two different levels, i.e. the indicator and the construct level. As suggested by Petter, Straub and Rai (2007), satisfactory content validity was ensured by conducting an extensive literature research and carefully scoping the domain of the constructs. Moreover, multi-collinearity was examined by calculating variance inflation factors (VIF) for both the inner model (formative measurements) and the outer model (indicators). While with reflective constructs, multicollinearity between items is desirable, it is a problem if measures are highly correlated in formative constructs, as this can destabilise the model (Petter et al., 2007). In the initial model, i.e. the one that includes all four channels, two VIF values exceeded the critical value of 10 (cf. Petter et al., 2007), namely the indicators 'Facebook followers' and 'Facebook likes'. As a consequence, the measure with the highest VIF value, i.e. 'Facebook likes', was removed to preserve reliability of the model. This manipulation is considered unproblematic, since the two measures are closely related and thus, removing one of them does not compromise content validity (cf. Petter et al., 2007). In examining the indicator validity of the additional models tested in this study, namely channel-specific models, the same procedure of removing indicators with high VIF values while

ensuring content validity was applied. Construct validity was assessed by examining inter-construct correlations and these correlations were less than 0.7 for almost all pairs (**Table 5**)., thus meeting the quality criteria suggested by Henseler, Ringle and Sinkovics (2009).

Table 5. Correlations among Major Constructs

	1	2	3	4	5
1. Innovativeness	**N/A**				
2. Sustainability Orientation	0.480	**N/A**			
3. Speed SM	0.384	0.274	**N/A**		
4. Scope SM	0.406	0.541	0.735	**N/A**	
5. Success SM	0.294	0.409	0.350	0.382	**N/A**

The correlations shown above refer to the initial model, i.e. the one that includes all channels and no control variables. The correlation coefficient between speed and scope of social media adoption slightly exceeds the critical value of 0.7, however, all other correlations remain below this threshold. The additional models that were tested also fulfilled the requirement of inter-construct correlations being below 0.7. As the next step, bootstrapping was performed, a technique that is widely used in PLS analysis to approximate the significance of indicator weights, loadings and path coefficients. While the minimum recommended number of iterations is 200 subsamples, a bootstrapping analysis with 500 subsamples, as suggested by Chin (1998), was performed. Outer weights and loadings were checked and found to be satisfactory in the majority of cases, with either indicator weights and/or indicator loadings being statistically significant. With a view to content validity, the few indicators with non-significant contributions were retained. As regards model reliability, the results of the quality criteria tests revealed values slightly outside the acceptability range in few cases. Instead of removing respective indicators or constructs as suggested by some experts, priority was given to preservation of content validity in this study (cf. Petter et al., 2007).

SmartPLS offers three different options for dealing with missing values, i.e. casewise deletion, pairwise deletion or mean replacement. In order to include a maximum number of cases for evaluation per path relationship, pairwise deletion was selected.

The analysis of the structural model was conducted in three steps. First, the R-square was determined for each of the dependent variables. Second, path coefficients, their T-values and significance levels were evaluated. In total, six models were tested: one consolidated model with and without control variables and four channel-specific that exclusively considered Facebook, Twitter, Instagram or YouTube, respectively. The results are described below.

4. Results

4.1 Descriptive Statistics

The test sample represents a heterogeneous group of companies, operating in a number of different industries, including manufacturing, services, retail/wholesale as well as media and publishing. **Table 6** provides an overview of descriptive statistics for the manifest variables with a metric scale. Besides minimum, maximum, mean and standard deviation, the median as well as the first and third quartiles were calculated for each continuous variable. The N indicates the number of cases that have been included in the respective analyses. From the data, it becomes clear that most of the manifest variables are not normally distributed. In terms of demographics, the data shows that the majority of companies included in the MDAX is well established, with 50 per cent older than 70 years. The distribution in terms of firm size, as measured by sales and the number of employees, reveals that the test sample contains a small number of very large companies. Considering the social media data, it can be seen that YouTube is the most frequently used channel (90 per cent), followed by Twitter, Facebook and Instagram. The distributions of the non-metric manifest variables used in the model are depicted in the following three graphs (**Figures 3 – 5**).

Table 6. Variable Descriptives

Variable	N	Min.	Max.	Mean	Std. Dev.	Q1	Median	Q3
#Employees	50	5	219,678	25,629	38,667.312	6,065	14,918	26,512
Firm Age	50	1	153	70.88	49.508	19.75	70.50	119.00
R&D Exp.	37	0	2.E+9	182,744,273	373,287,637	10,200,000	64,000,000	184,762,500
Sales	50	31,500,000	7.E+10	9.61E+9	1.588E+10	1.5E+9	3.71E+9	9.73E+9
R&D/Sales Ratio	37	0	0.0981	0.025	0.0254	0.00202	0.01909	0.03924
#Patent Applications in 2015	50	0	3912	215.56	615.28	0.00	14.00	119.75
Twitter Adoption Ratio	50	0	0.830	0.487	0.288	0.170	0.625	0.750
#Tweets per day	42	0	17.200	2.143	3.194	0.308	1.025	6.368
#Twitter Followers	42	2	671,060	31,271	125718	474	1852	5144
Facebook Adoption Ratio	50	0	0.640	.261	0.216	0.000	0.250	0.448
#Facebook Posts	37	0	12,296	1,257	2167	314	587	1,392
#Facebook Followers	37	0	7,747,736	418,336	1,492,537	1,077	11,461	59,220
YouTube Adoption Ratio	50	0	0.9200	0.4014	0.2249	.2300	0.4600	0.5600
#YouTube Videos	45	1	1,363	163	275	29	76	158
#YouTube Subscribers	43	4	212,046	7,706	32,821	85	689	2,084
Instagram Adoption Ratio	43	0	1.0000	0.1898	0.2848	0.00	0.00	0.38
#Instagram Posts	23	0	3,676	559	954	0.00	115	660
#Instagram Followers	23	2	31,200,000	1,535,949	6,491,685	87	399	9,268

Figure 3. Collaboration with External Partners (N=50)

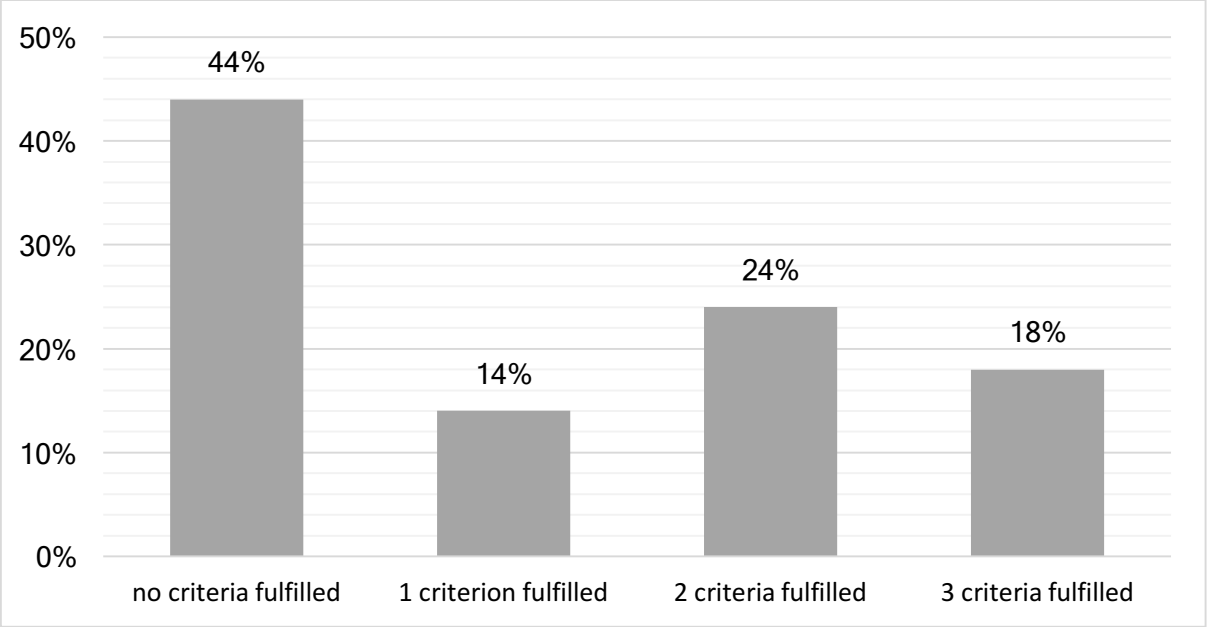


Figure 4. Sustainability Orientation (N=50)

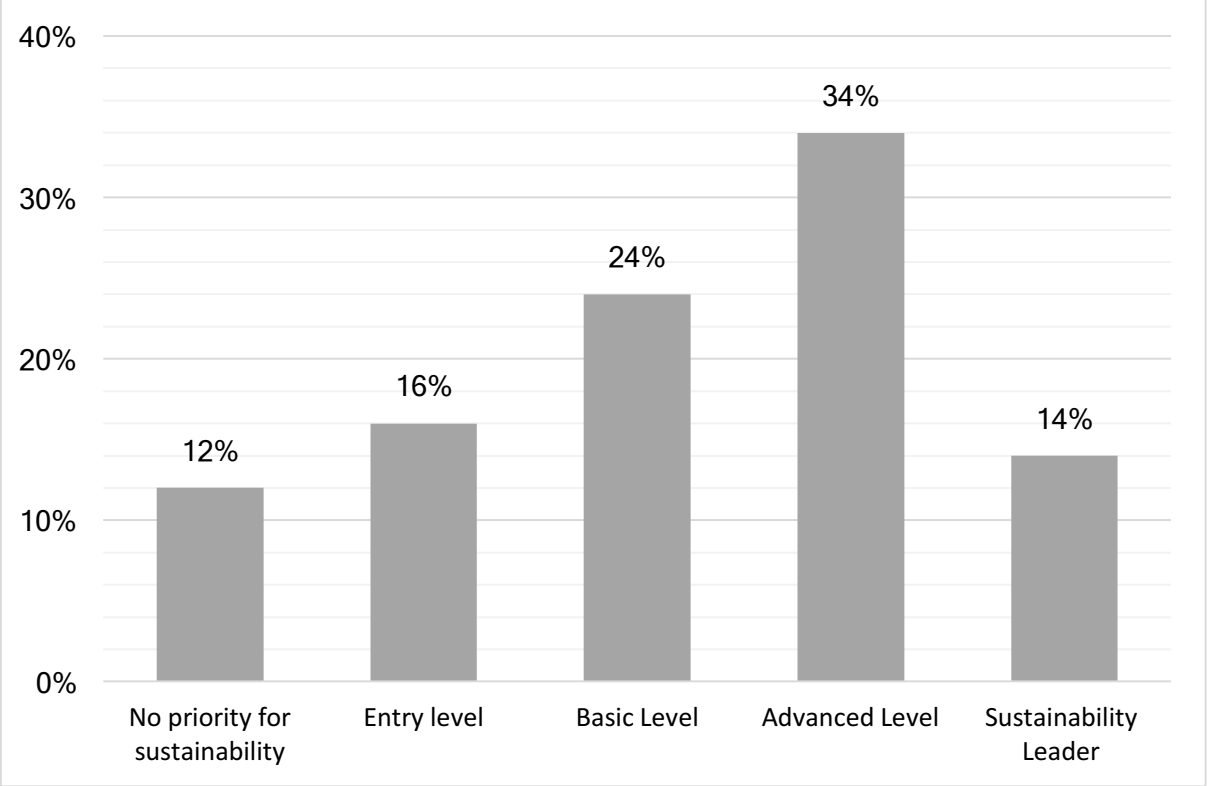
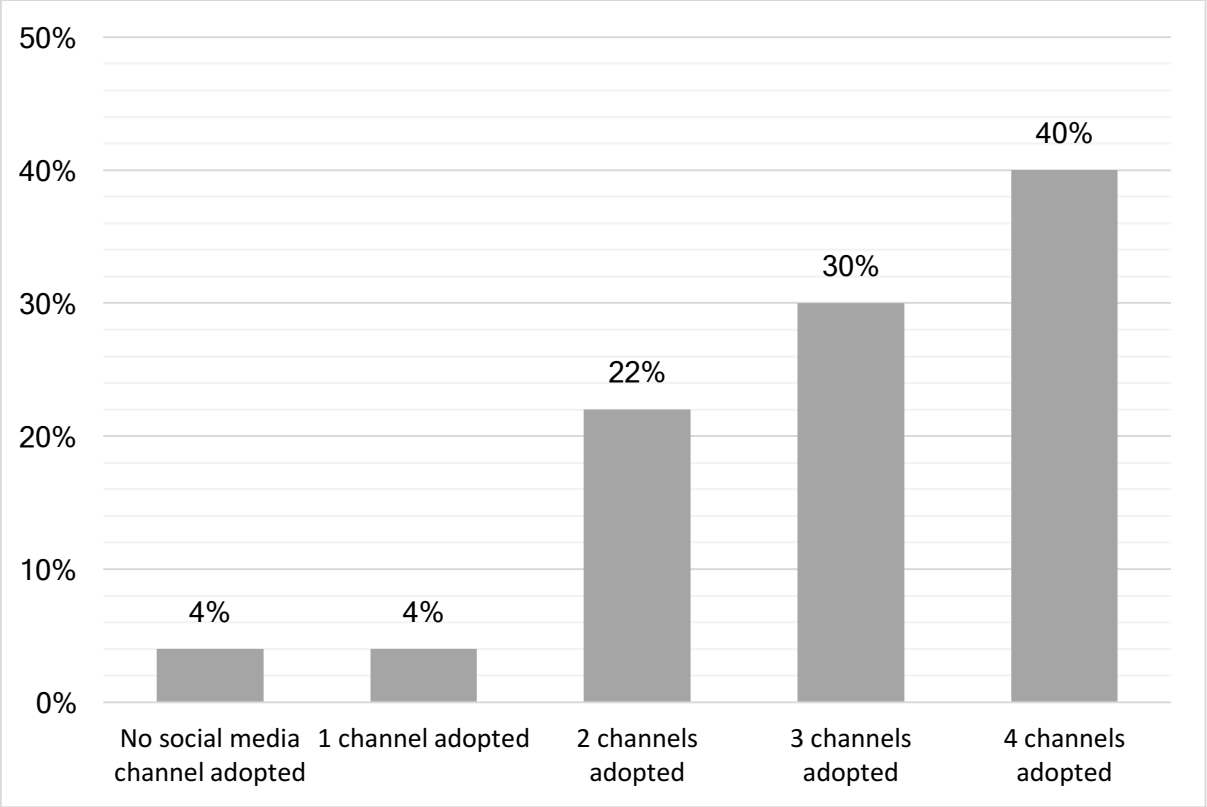


Figure 5. Number of Social Media Channels Adopted



4.2 Test of Hypotheses

Hypotheses 1a, 2b and 2c are supported on the basis of the initial consolidated model, i.e. the model that includes all four channels, assuming a significance level of α=0.1, α=0.05 and α=0.1 respectively. Considering the channel-specific models, no statistically significant relationships are found between either of the latent variables for Twitter and Instagram. However, the model that specifically regards Facebook, shows a positive relationship between firm sustainability orientation and speed of SM adoption. The results of the model that exclusively considers social media data for YouTube indicate a positive relationship between firm innovativeness and speed as well as between firm innovativeness and the scope of SM adoption. None of the models reveals a positive relationship between firm innovativeness and success of SM usage. In summary, according to the main model, three out of the six hypotheses are supported, namely hypothesis 1a, 2b and 2c. The results of the test of hypotheses are summed up in **Table 7**.

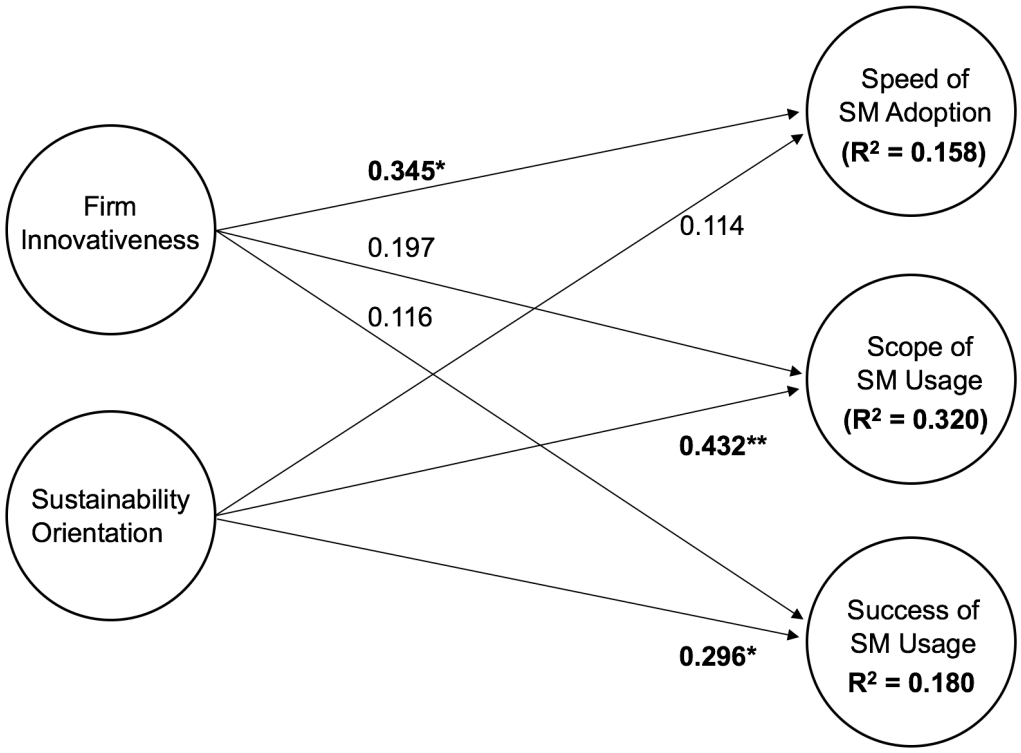
Table 7. Results of Test of Hypotheses

		All channels	Facebook	Twitter	YouTube	Instagram
H1a	Firm innovativeness will determine the *speed* of SM adoption.	**Supported (*)**	Not supported	Not supported	**Supported (**)**	Not supported
H1b	Firm innovativeness will determine the *scope* of SM usage.	Not supported	Not supported	Not supported	**Supported (**)**	Not supported
H1c	Firm innovativeness will determine the *success* of SM usage.	Not supported	Not supported	Not supported	Not supported	Not supported
H2a	Firms' sustainability orientation will determine the *speed* of SM adoption.	Not supported	**Supported (**)**	Not supported	Not supported	Not supported
H2b	Firms' sustainability orientation will determine the *scope* of SM usage.	**Supported (**)**	Not supported	Not supported	Not supported	Not supported
H2c	Firms' sustainability orientation will determine the *success* of SM usage.	**Supported (*)**	Not supported	Not supported	Not supported	Not supported

(*) supported at $\alpha = 0.1$; (**) supported at $\alpha = 0.05$

As for the main model, the path coefficients of the key constructs range from 0.114 to 0.432**, with one path coefficient being statistically significant at the 0.05 level and two path coefficients being significant at a 0.1 level, as is depicted in **Figure 6**. The R-square values of 0.158, 0.32 and 0.180 indicate weak to moderate explanatory power of the main model. When adding firm size (as measured by sales) and firm age as control variables, the R-squares for speed, scope and success of SM adoption change to 0.237, 0.315 and 0.262 respectively. This increase in the R-square values for speed and success of SM adoption indicates that demographic company characteristics account for an incremental proportion of the variance in these dependent variables. For the channel-specific models, significant path coefficients range from 0.27 to 0.387. The R-square values for the three exogenous variables remain below 0.125, which implies that the main model, i.e. the one including all four channels, offers higher explanatory power than the channel-specific models.

Figure 6. Statistical Results of Main Model



(*p<0.1; **p<0.05)

Following modification of the initial model by adding the control variables, variance inflation factors, path coefficients, R-Squares, T-statistics and p-values were recalculated and compared to the results obtained in the base model. Only one of the two control variables, i.e. firm age, was found to be significantly related to social media adoption. Specifically, the results indicate a negative relationship between firm age and speed of SM adoption as well as between firm age and scope of SM usage. Two of the significant path relationships found in the absence of control variables disappear after adding firm age and firm size, with only the relationship between SO and scope of SM usage remaining significant at the level of ten percent. These results indicate that either the model is at the threshold of acceptability with regard to robustness or the test sample is too small. An alternative explanation would be that the control variables are not relevant in predicting the dependent variables.

The original SmartPLS results reports as summarised above can be found in the Appendix (**Appendices 3-8**).

4.3 Additional Findings

In view of the rather low predictive power of the model and the fact that not all paths were found to be significant, a number of additional analyses were performed, revealing interesting results. The effects of firm innovativeness and sustainability orientation on SM adoption were examined separately, keeping the basic structure of the model the same. Interestingly, the model considering solely innovativeness reveal highly significant results for the effects on speed ($T=3.807$, $p<0.001$) and scope of SM adoption ($T=4.153$, $p<0.001$). However, R-square values of 0.149 (speed), 0.170 (scope) and 0.075 (success of SM usage) imply that the initial model which includes both independent variables has higher explanatory power than an alternative model regarding innovativeness only. The model considering sustainability orientation as the only independent variable provides support for all three relationships tested, namely the influence of SO on speed ($T=1.984$, $p=0.048$), scope ($T=4.296$, $p<0.001$) and success ($T=2.949$, $p=0.003$) of SM adoption. The R-square values relating to success is slightly higher than in the initial model (0.186 vs. 0.180), whereas the values corresponding to speed and scope are lower compared to the base model (0.091 vs. 0.158 and 0.307 vs. 0.320). These figures indicate that a higher proportion of the variance in scope and success is explained by sustainability orientation, while a higher proportion of the variance in speed of SM adoption is explained by firm innovativeness. While the initial consolidated model appears to explain a higher proportion of the variance in speed and scope of SM adoption, the alternative model considering only SO seems to explain a slightly greater proportion of the variance in success of SM adoption.

The SmartPLS results reports of these additional models can be found in **Appendix 9**.

5. Discussion

The current study contributes to the limited research on corporate social media usage by building on previous literature (e.g. Lee et al., 2013; Wamba & Carter, 2013; Siamagka et al., 2015) to model determinants of SM adoption. The study demonstrates that firm innovativeness

and sustainability orientation play an important role in explaining the speed, scope and success of social media adoption. Specifically, the results indicate that more innovative companies adopt social media earlier than those that put less emphasis on innovation (H1a), while businesses that have a higher sustainability orientation seem to use SM more extensively (H2b) and be more successful in terms of attaining high numbers of followers and engaging users (H2c). These findings are in line with previous literature on technology adoption (e.g. Frambach & Schillewaert, 2002), which suggests that organisational innovativeness has an impact on the adoption of new technologies such as the internet. Regarding the role of sustainability orientation in determining SM adoption, the results only partly confirm the findings of Lee et al. (2013), who find that more socially responsible firms are faster in adopting SM and more successful in building up a large online presence. While evidence was found for the influence of firm innovativeness on the speed of SM adoption, the hypothesised positive relationship between innovativeness and scope as well as between innovativeness and success of SM is not supported by the model. Interestingly, the relationships identified as significant are unidirectional, i.e. only one significant path per dependent variable was found, contrasting the multidirectional relationships that were hypothesised. Considering that in the two alternative models which tested the same structural paths separately for each independent variable both independent variables were found to be significantly related with the scope of SM, it is possible that complex interaction effects are at play.

5.1 Implications for Theory

The above described findings imply that although more innovative firms are faster in adopting web-based technologies, specifically social media (H1a), they are not necessarily more successful in using these media than their less innovative counterparts (H1c). One possible explanation for this is that companies that are more innovative (in terms of product innovations, R&D investment and inter-organisational collaboration), are constantly screening their

environment for new technologies, and might perceive it as less risky to adopt them. On the other hand, in being early adopters of SM, highly innovative companies might not have an elaborate SM strategy in place from the beginning, but rather aim to develop expertise 'on-the-job'. In addition, the success of organisational SM usage rather seems to depend on factors related to a company's ability to understand their users and develop content that fits their preferences, as suggested by Kaplan and Haenlein (2010). This, in turn, appears to give firms with a higher sustainability orientation an advantage over companies less focused on sustainability, which could be partly due to their positive image as well as their 'positive social orientation toward stakeholders' (Lee et al., 2013, p.803). Following the rationale of Lee et. al (2013), more sustainable firms have built a system of social support around themselves which allows them to better absorb the risks associated with using SM, and to be more successful in terms of reaching a high number of followers. This seems to be reasonable, since companies that have developed stronger ties with their stakeholder have a better understanding of stakeholders' interests and thus know which content they are likely to engage with. Considering that the present study measured sustainability orientation through a quality assessment of firms' sustainability practices by analysing corporate reports and websites, an additional factor might be that more sustainable companies are more competent in effectively communicating relevant content to stakeholders. While the findings of this study are in line with those of Lee et al. (2013) in terms of the association between a firms' SO and their ability to build a large online presence, and engage users (H2c), there are also differences in results. Whereas Lee et al. (2013) do not find support for a connection between a high CSR rating and a high degree of firm-driven communication, the results of this study indicate that firms with a higher SO are indeed more likely to publish a high number of posts (H2b). This challenges Lee et al.'s (2013) conclusion about social media requiring less control from companies than do traditional media and suggests that, although with SM it becomes more important to listen to your users, firm-driven messages still play an important role in stimulating user-driven communication.

While most prior studies on social media adoption focus on one or two SM channels, with a clear focus on Twitter, the study at hand considers four different channels, namely Twitter, Facebook, YouTube and Instagram in modelling determinants of SM adoption. Contemplating the results of the channel-specific models that were tested and comparing these results to the main model, it is striking that the results of the Twitter- and Instagram-specific models do not support any of the hypotheses. The results of those models that solely include SM data from Facebook and YouTube indicate that firms with a higher sustainability orientation adopted Facebook faster than firms that score low in SO, and that more innovative firms adopted YouTube earlier and are more active on YouTube than less innovative companies. These differences between the results of the main model and the channel-specific models might imply different motivations and goals of companies in adopting different SM channels. While the adoption of Twitter and Instagram by firms might be determined by factors not specifically contemplated in this study, such as industry affiliation (cf. Smith et al., 2015), the adoption of Twitter and YouTube seems to be related with innovativeness and sustainability orientation. Specifically, the differing outcomes could signify that companies with a high SO are more likely to be early adopters of Facebook because it allows for a high level of interaction with users (cf. Ngai, Moon et al., 2015) and thus enables firms to develop long-term social relationships with stakeholders. On the other hand, YouTube might be specifically relevant for companies with a strong focus on innovation, because it allows them to demonstrate their innovation efforts and technological capabilities via video content. Examples illustrating this include Rational AG, Krones AG and Airbus, companies that rely heavily on technology and use YouTube most extensively among the firms in the sample with most of their video content revolving around technology. Irrespective of the specific relationships found, companies appear to consider different evaluation criteria when deciding to adopt a particular social media channel. This, in turn, is suggestive of dissimilarities in the nature of different social media, as outlined in detail above.

In theoretical terms, the model presented above illustrates important determinants of social media utilisation that go beyond merely demographic characteristics such as firm size or industry affiliation. The findings complement previous research (e.g. Michaelidou et al., 2011; Wamba & Carter, 2013; Lee et al, 2013; Siamagka et al., 2015) showing that more innovative organisations are faster in adopting SM, while organisations with a higher SO are more active on SM and are more successful in terms of achieving a high number of followers and leading users to like, comment and share their content. This study further enhances the state of knowledge in the area of corporate social media usage by distinguishing between three different dimensions, namely speed of adoption, scope and success of SM practices. The test sample used represents a group of companies positioned one level below the top global players which has never been studied in this context before. Furthermore, the model reveals interesting findings in terms of the interrelations between the control variables and social media adoption by firms. While firm age was found to be significantly negatively related to speed and scope of SM adoption, no relation was found between firm size and any of the three SM-related outcome variables. This implies that more traditional firms seem to be slower in adopting SM and appear to be less active on these media than younger firms. The fact that firm size was not found to be a determinant of SM adoption is well in line with the inconsistent results published in the scientific literature, as some researchers confirmed a positive relationship (e.g. Saldanha & Krishnan, 2012; Smith et al., 2015) and others obtained contrary results (e.g. Perrigot et al., 2012; Wamba & Carter, 2013).

5.2 Practical Implications

In addition to its theoretical contributions, this study is relevant for both businesses and investors or analysts from a practical perspective. First, as argued at the beginning of this paper, firm innovativeness and sustainability orientation both, to a certain degree, reflect a firm's stakeholder focus and its capability to develop and maintain positive relationships with different

stakeholders, including customers, investors and the broader society. The findings suggest that organisations which are driven by this motivation appear to be more successful in using social media, which in turn enables them to achieve high awareness, and obtain valuable information and feedback from users. For businesses, this implies that they should particularly contemplate the effect that their sustainability orientation has on their SM success when deciding about strategic priorities. Since firms with a higher SO seem to have a clear advantage in employing social media, their return-on-investment related to adopting different social media channels might be higher than for firms with a lower SO. Therefore, managers might want to redirect resources towards social media activities in order to capitalise on these opportunities (cf. Lee et al., 2013). On the other hand, managers of firms that are less focused on sustainability and have weaker social ties with their stakeholders should be careful in leveraging social media, as they seem to face greater potential risk of failing to succeed.

In view of convincing evidence supporting a relationship between social media and financial performance (e.g. Rodriguez et al., 2012; Luo & Zhang, 2013; Roberts et al., 2016), the explanatory model developed in this study might be useful for investors and analysists in predicting future business success. Innovativeness and sustainability orientation could function as early indicators of success in SM, which appears to be a vital prerequisite for future business success. Prediction models like the one developed in this study seem to be particularly relevant for publicly traded companies, considering that social media even affects analyst stock recommendations, as shown by Kim & Youm (2017). However, to achieve a satisfactory predictive value which is essential for such purposes, the model needs to be refined in terms of its reliability and other quality criteria. One possible explanation for the limited predictive power of the model is the existence of additional indicators which could not be considered in view of the information sources used for this study. In further developing the structural model, potential alternative or additional factors to be considered include firms' social media budget and factors related to human resources such as social media expertise or the number of

employees responsible for the firm's SM presence. The limitations of this study as well as future research directions are discussed in more detail in the following section.

5.3 Limitations & Future Research Directions

In spite of the above discussed contributions, the present study is not without limitations. With regard to timing of data collection, the present study is of cross-sectional nature. However, in view of the information sources used, there are longitudinal elements as well, since corporate information is published retrospectively and the corporate reports used largely refer to the years 2015 and 2016, whereas social media data was collected in 'real-time' in the middle of 2017. Nevertheless, in order to account for the fact that the scope of SM usage seems to be dependent on how long a company has been using the respective channel, a longitudinal study that considers these time lag might provide more robust results.

Another limitation is that the measures used for innovativeness might not be sufficiently detailed and comprehensive to accurately reflect the degree to which a company is focused on innovation. In order to improve the precision and reliability of these indicators, future research should include additional aspects related to innovation that could not be accounted for in this study. Such aspects could, for example, include details about the new product development process, which probably require a survey or interview approach in order to obtain internal information from companies. In a similar vein, although based on proven expert criteria, the sustainability rating used in this study might not represent a firm's genuine commitment to sustainability and its stakeholders. Future research should focus on refining this measure by e.g., additionally drawing on survey data. It became obvious that many of the companies from the test sample have multiple social media profiles, whereas this study only considered the main corporate profile per company, which in most cases had the highest number of followers. Brand- or country-specific profiles were not taken into account but rather the global company profiles were considered. Consequently, companies that maintain different profiles at the level

of subsidiaries, business units and/or brands might have been underrated in terms of their SM activities. Future research should undertake a more comprehensive collection of social media data, using not only SM analytics tools but adequate software that extracts data automatically.

A further possible limitation of this study is that the sample size of 50 may be too small to obtain sufficiently robust results with regard to both, using the model for hypothesis testing and for prediction. Although the PLS method is generally suitable for small sample sizes (Chin & Newsted, 1999), common issues associated with small samples will remain and might restrict the significance of the obtained results. These issues include, e.g., insufficient representativeness of the sample in terms of reflecting population characteristics and the resulting sample bias. Future research should for example make sure that different industries are represented equally within the sample in order to obtain generalizable results.

Another limitation stems from the formative nature of the constructs used in this study, which requires a different approach in assessing quality criteria compared to reflective constructs. Especially validity assessment is a controversial issue in the literature on formative measurement (Diamantopoulos, Riefler & Roth, 2008). While researchers focusing on the PLS methodology itself propose to remove any indicator that does not significantly contribute to a construct (Diamantopoulos, Riefler & Roth, 2008), the current study follows practitioners (e.g. Braojos-Gomez, Benitez-Amado & Llorens-Montes, 2015) in giving priority to content validity rather than strict statistical quality criteria. Especially considering the rather low R-square values obtained for the dependent variables, future research should aim to refine the model and optimise the quality criteria in order to increase the predictive power of the model. Finally, it is likely that there are other variables that determine social media adoption apart from those accounted for in this model. Therefore, future research should use a comprehensive number of variables, including social media budget and expertise, in modelling determinants of SM adoption and identify those that have the highest explanatory power.

Given that organisational social media usage is still a rather unexplored field and most research focuses on considering SM from a pure marketing perspective, it appears to be a promising avenue to integrate different research streams in exploring determinants of successful SM adoption.

References

Adams, R., Jeanrenaud, S., Bessant, J., Denyer, D., & Overy, P. (2016). Sustainability-oriented Innovation: A Systematic Review: Sustainability-oriented Innovation. *International Journal of Management Reviews*, 18(2), 180–205.

Alexiev, A. S., Volberda, H. W., & Van den Bosch, F. A. J. (2016). Interorganisational collaboration and firm innovativeness: Unpacking the role of the organisational environment. *Journal of Business Research*, 69(2), 974–984.

Andriole, S. J. (2010). Business impact of Web 2.0 technologies. *Communications of the ACM*, 53(12), 67.

Barger, V., & Labrecque, L. (2013). An integrated marketing communications perspective on social media metrics. *International Journal of Integrated Marketing Communications*, 5(1).

Barnes N.G. 2010. How Do the Most Successful Companies Use Social Media? *Marketing Research* 22(1), 6–13.

Barwise, P. & Meehan, S. (2010). The one thing you must get right when building a brand. *Harvard Business Review*, 88(12).

Berthon, P. R., Pitt, L. F., Plangger, K., & Shapiro, D. (2012). Marketing meets Web 2.0, social media, and creative consumers: Implications for international marketing strategy. *Business Horizons*, 55(3), 261–271.

Bharati, P., Zhang, C., & Chaudhury, A. (2014). Social media assimilation in firms: Investigating the roles of absorptive capacity and institutional pressures. *Information Systems Frontiers*, 16(2), 257–272.

Bonsón, E., & Flores, F. (2011). Social media and corporate dialogue: the response of global financial institutions. *Online Information Review*, 35(1), 34–49.

Braojos-Gomez, J., Benitez-Amado, J., & Javier Llorens-Montes, F. (2015). How do small firms learn to develop a social media competence? *International Journal of Information Management*, 35(4), 443–458.

Brennan, R., & Croft, R. (2012). The use of social media in B2B marketing and branding: An exploratory study. *Journal of Customer Behaviour*, 11(2), 101–115.

Chan, Y. Y. Y., & Ngai, E. W. T. (2011). Conceptualising electronic word of mouth activity: An input-process-output perspective. *Marketing Intelligence & Planning*, *29*(5), 488–516.

Chin, W. W. (1998). The partial least squares approach for structural equation modeling. In G. A. Macoulides (Ed.), *Modern methods for business research* (pp. 295-336). Mahwah, NJ: Lawrence Erlbaum.

Chin, W. W., & Newsted, P. R. (1999). Structural equation modeling analysis with small samples using partial least squares. In R. H. Hoyle (Ed.), *Statistical strategies for small sample research* (pp. 307-341). Thousand Oaks: CA: Sage Publications.

Claudy, M. C., Peterson, M., & Pagell, M. (2016). The Roles of Sustainability Orientation and Market Knowledge Competence in New Product Development Success. *Journal of Product Innovation Management*, 33, 72–85.

Crittenden, V. L., Crittenden, W. F., Ferrell, L. K., Ferrell, O. C., & Pinney, C. C. (2011). Market-oriented sustainability: a conceptual framework and propositions. *Journal of the Academy of Marketing Science*, 39(1), 71–85.

Culnan, M., McHugh, P. J. & I. Zubillaga, J. (2010). How Large U.S. Companies Can Use Twitter and Other Social Media to Gain Business Value. *MIS Quarterly Executive*. 9. 243-259.

Davis, F. D. 1989. Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology. *MIS Quarterly* 13(3):319–40.

Deutsche Börse AG (2004). Information Services: Die Indizes der Deutsche Börse AG. Retrieved from: http://deutsche-boerse.com/dbg/dispatch/de/binary/gdb_content_pool/imported_files/public_files/10_downloads/20_indices_misc/Information_Services_Indizes.pdf

Diamantopoulos, A., Riefler, P., & Roth, K. P. (2008). Advancing formative measurement models. *Journal of Business Research*, *61*(12), 1203–1218.

Dibrell, C., Craig, J. B., & Neubaum, D. O. (2014). Linking the formal strategic planning process, planning flexibility, and innovativeness to firm performance. *Journal of Business Research*, 67(9), 2000–2007.

Drell, L., & Davis, J. (2014). Getting started with social media success metrics. *Marketing Research*, 26(5), 22-27.

Du, S., Yalcinkaya, G., & Bstieler, L. (2016). Sustainability, Social Media Driven Open Innovation, and New Product Development Performance. *Journal of Product Innovation Management*, 33, 55–71.

Ernst & Young GmbH Wirtschaftsprüfungsgesellschaft. (2014). Pflicht oder Kür? Nachhaltigkeitsberichterstattung in Deutschland: Standortbestimmung. Retrieved from: http://www.ey.com/Publication/vwLUAssets/EY_Studie_-_Pflicht_oder_Kuer/$FILE/EY-Studie-PflichtoderKuer-2014.pdf

Eyrich, N., Padman, M. L., & Sweetser, K. D. (2008). PR practitioners' use of social media tools and communication technology. *Public Relations Review*, 34(4), 412–414.

Frambach, R., & Schillewaert, N. (2002). Organisational innovation adoption: A multi-level framework of determinants and opportunities for future research. *Journal of Business Research*, 55(2), 163-176.

Freeman, R. E., Wicks, A. C., & Harrison, J. S. (2007). *Managing for Stakeholders: Survival, Reputation, and Success*. New Haven [Conn.]: Yale University Press.

Gallaugher, J., & Ransbotham. S. (2010). Social Media and Customer Dialog Management at Starbucks. *MIS Quarterly Executive*, 9(4), 197-212.

Gensler, S., Völckner, F., Liu-Thompkins, Y., & Wiertz, C. (2013). Managing Brands in the Social Media Environment. *Journal of Interactive Marketing*, 27(4), 242–256.

GlobalWebIndex. (2017). Daily time spent on social networking by internet users worldwide from 2012 to 2017 (in minutes). In *Statista - The Statistics Portal*. Retrieved December 20, 2017, from https://www.statista.com/statistics/433871/daily-social-media-usage-worldwide/

Hanna, R., Rohm, A., & Crittenden, V. L. (2011). We're all connected: The power of the social media ecosystem. *Business Horizons*, 54(3), 265–273.

He, W., Wang, F.-K., Chen, Y., & Zha, S. (2017). An exploratory investigation of social media adoption by small businesses. *Information Technology and Management*, 18(2), 149–160.

Hemsley, J., & Mason, R. M. (2013). Knowledge and Knowledge Management in the Social Media Age. *Journal of Organisational Computing and Electronic Commerce*, 23(1–2), 138–167.

Henderson, A., & Bowley, R. (2010). Authentic dialogue? The role of "friendship" in a social media recruitment campaign. *Journal of Communication Management*, 14(3), 237–257.

Henseler, J., Ringle, C. M., & Sinkovics, R. R. (Eds.). (2009). *Advances in International Marketing*, 20, 277-320.

Jansen, B. J., Zhang, M., Sobel, K., & Chowdury, A. (2009). Twitter power: Tweets as electronic word of mouth. *Journal of the American Society for Information Science and Technology*, 60(11), 2169–2188.

Järvinen, J., Töllinen, A. & Karjaluoto, H. & Jayawardhena, C. (2012). Digital and social media marketing usage in B2B industrial section. *Marketing Management Journal*. 22. 102-117.

Jin, S. (2012). The potential of social media for luxury brand management. *Marketing Intelligence & Planning*, *30*(7), 687–699.

Kane, G.C. (2015). Enterprise social media: Current capabilities and future possibilities. *MIS Quarterly Executive*, 14(1), 1-16.

Kaplan, A. M., & Haenlein, M. (2010). Users of the world, unite! The challenges and opportunities of Social Media. *Business Horizons*, 53(1), 59–68.

Kazadi, K., Lievens, A., & Mahr, D. (2016). Stakeholder co-creation during the innovation process: Identifying capabilities for knowledge creation among multiple stakeholders. *Journal of Business Research*, 69(2), 525–540.

Kietzmann, J. H., Hermkens, K., McCarthy, I. P., & Silvestre, B. S. (2011). Social media? Get serious! Understanding the functional building blocks of social media. *Business Horizons*, 54(3), 241–251.

Kim, E.-H., & Youm, Y. N. (2017). How Do Social Media Affect Analyst Stock Recommendations? Evidence from S&P 500 Electric Power Companies' Twitter Accounts: How Do Social Media Affect Analyst Stock Recommendations? *Strategic Management Journal*, 38(13), 2599–2622.

Kumar, V., Choi, J. B., & Greene, M. (2017). Synergistic effects of social media and traditional marketing on brand sales: capturing the time-varying effects. *Journal of the Academy of Marketing Science*, *45*(2), 268–288.

Lee, K., Oh, W.-Y., & Kim, N. (2013). Social Media for Socially Responsible Firms: Analysis of Fortune 500's Twitter Profiles and their CSR/CSIR Ratings. *Journal of Business Ethics*, 118(4), 791–806.

Lee, G., & Xia, W. (2006). Organisational size and IT innovation adoption: A meta-analysis. *Information & Management*, 43(8), 975–985.

Leonardi, P. (2014). Social media, knowledge sharing, and innovation: Toward a theory of communication visibility. *Information Systems Research*, 25(4), 796-816.

Leonardi, P. M., Huysman, M., & Steinfield, C. (2013). Enterprise Social Media: Definition, History, and Prospects for the Study of Social Technologies in Organisations. *Journal of Computer-Mediated Communication*, 19(1), 1–19.

Luo, X., Zhang, J., & Duan, W. (2013). Social Media and Firm Equity Value. *Information Systems Research*, 24(1), 146–163.

Mackelprang, A. W., Habermann, M., & Swink, M. (2015). How firm innovativeness and unexpected product reliability failures affect profitability. *Journal of Operations Management*, 38, 71–86.

Maecker, O., Barrot, C., & Becker, J. U. (2016). The effect of social media interactions on customer relationship management. *Business Research*, 9(1), 133–155.

Mangold, W. G., & Faulds, D. J. (2009). Social media: The new hybrid element of the promotion mix. *Business Horizons*, 52(4), 357–365.

Mazboudi, M., & Khalil, S. (2017). The attenuation effect of social media: Evidence from acquisitions by large firms. *Journal of Financial Stability*, 28, 115–124.

Michaelidou, N., Siamagka, N. T., & Christodoulides, G. (2011). Usage, barriers and measurement of social media marketing: An exploratory investigation of small and medium B2B brands. *Industrial Marketing Management*, 40(7), 1153–1159.

Michelino, F., Lamberti, E., Cammarano, A., & Caputo, M. (2015). Measuring Open Innovation in the Bio-Pharmaceutical Industry: Measuring Open Innovation in The Bio-Pharmaceutical Industry. *Creativity and Innovation Management*, 24(1), 4–28.

Moutinho, L., & Huarng, K.-H. (Eds.). (2016). Quantitative modelling in marketing and management (2nd edition). New Jersey: World Scientific.

Mozas-Moral, A., Bernal-Jurado, E., Medina-Viruel, M. J., & Fernández-Uclés, D. (2016). Factors for success in online social networks: An fsQCA approach. *Journal of Business Research*, 69(11), 5261–5264.

Nah, S., & Saxton, G. D. (2013). Modelling the adoption and use of social media by non-profit organisations. *New Media & Society*, 15(2), 294–313.

Navarro, C., Moreno, A., & Al-Sumait, F. (2017). Social media expectations between public relations professionals and their stakeholders: Results of the ComGap study in Spain. *Public Relations Review*, 43(4), 700–708.

Ngai, E. W. T., Tao, S. S. C., & Moon, K. K. L. (2015). Social media research: Theories, constructs, and conceptual frameworks. *International Journal of Information Management*, 35(1), 33–44.

Ngai, E.W.T., Moon, K.K., Lam, S.S., Chin, E.S.K. & Tao, S.S.C. (2015). Social media models, technologies, and applications: An academic review and case study. *Industrial Management & Data Systems*, Vol. 115 Issue: 5, pp.769-802.

Oh, C., Roumani, Y., Nwankpa, J. K., & Hu, H.-F. (2017). Beyond likes and tweets: Consumer engagement behaviour and movie box office in social media. *Information & Management*, 54(1), 25–37.

Ott, L., & Theunissen, P. (2015). Reputations at risk: Engagement during social media crises. *Public Relations Review*, 41(1), 97–102.

Paniagua, J., & Sapena, J. (2014). Business performance and social media: Love or hate? *Business Horizons*, 57(6), 719–728.

Parthasarthy, R., & Hammond, J. (2002). Product innovation input and outcome: moderating effects of the innovation process. *Journal of Engineering and Technology Management*, 19(1), 75–91.

Pauwels, K., Aksehirli, Z., & Lackman, A. (2016). Like the ad or the brand? Marketing stimulates different electronic word-of-mouth content to drive online and offline performance. *International Journal of Research in Marketing*, 33(3), 639–655.

Perrigot, R., Kacker, M., Basset, G., & Cliquet, G. (2012). Antecedents of Early Adoption and Use of Social Media Networks for Stakeholder Communications: Evidence from Franchising. *Journal of Small Business Management*, 50(4), 539–565.

Peters, K., Chen, Y., Kaplan, A. M., Ognibeni, B., & Pauwels, K. (2013). Social Media Metrics — A Framework and Guidelines for Managing Social Media. *Journal of Interactive Marketing*, *27*(4), 281–298.

Petter, S., Straub, D., & Rai, A. (2007). Specifying Formative Constructs in Information Systems Research. *MIS Quarterly*, 31(4), 623. https://doi.org/10.2307/25148814

Piñeiro-Chousa, J., Vizcaíno-González, M., & Pérez-Pico, A. M. (2017). Influence of Social Media over the Stock Market. *Psychology & Marketing*, 34(1), 101–108.

Ping, R. A. (2002). Testing latent variable models with survey data. Retrieved December 18, 2017 from: http://www.wright.edu/~robert.ping/lv1/in_i.doc

Raeth, P., Urbach, N., Smolnik, S., Butler, B.S. & Königs, P. (2010). The Adoption of Web 2.0 in Corporations: A Process Perspective. Americas Conference on Information Systems (AMCIS). AMCIS 2010 Proceedings.

Reuters Institute for the Study of Journalism. (2017). Global active usage penetration of leading social networks as of February 2017. In *Statista - The Statistics Portal*. Retrieved December 20, 2017, from https://www.statista.com/statistics/274773/global-penetration-of-selected-social-media-sites/

Ringle, C. M., Wende, S., and Becker, J.-M. 2015. "SmartPLS 3." Boenningstedt: SmartPLS GmbH, http://www.smartpls.com.

Rishika, R., Kumar, A., Janakiraman, R., & Bezawada, R. (2013). The Effect of Customers' Social Media Participation on Customer Visit Frequency and Profitability: An Empirical Investigation. *Information Systems Research*, 24(1), 108–127.

RobecoSAM (2017). Measuring Intangibles: RebecoSAM's Corporate Sustainability Asessment Methodology. Retrieved November 20th, 2017 from: http://www.robecosam.com/images/Measuring_Intangibles_CSA_methodology.pdf

Roberts, D. L., Piller, F. T., & Lüttgens, D. (2016). Mapping the Impact of Social Media for Innovation: The Role of Social Media in Explaining Innovation Performance in the PDMA Comparative Performance Assessment Study. *Journal of Product Innovation Management*, 33, 117–135.

Rodriguez, M., Peterson, R. M., & Krishnan, V. (2012). Social Media's Influence on Business-to-Business Sales Performance. *Journal of Personal Selling & Sales Management*, 32(3), 365–378.

Roxas, B., & Coetzer, A. (2012). Institutional Environment, Managerial Attitudes and Environmental Sustainability Orientation of Small Firms. *Journal of Business Ethics*, 111(4), 461–476.

Saldanha, T. J. V., & Krishnan, M. S. (2012). Organisational Adoption of Web 2.0 Technologies: An Empirical Analysis. *Journal of Organisational Computing and Electronic Commerce*, 22(4), 301–333.

Schlagwein, D., & Hu, M. (2016). How and why organisations use social media: five use types and their relation to absorptive capacity. *Journal of Information Technology*, 32(2), 194–209.

Schlagwein, D., & Prasarnphanich, P. (2014). Social Media Around the GLOBE. *Journal of Organisational Computing and Electronic Commerce*, *24*(2–3), 122–137.

Schniederjans, D., Cao, E. S., & Schniederjans, M. (2013). Enhancing financial performance with social media: An impression management perspective. *Decision Support Systems*, 55(4), 911–918.

Shinal, John (2017). YouTube claims 1.5 billion monthly users as it races to boost video-ad business. *CNBC*. Retrieved December 20, 2017, from https://www.cnbc.com/2017/06/22/youtube-claims-1-point-5-billion-monthly-users.html

Siamagka, N.-T., Christodoulides, G., Michaelidou, N., & Valvi, A. (2015). Determinants of social media adoption by B2B organisations. *Industrial Marketing Management*, 51, 89–99.

Sivertzen., A.-M., Nilsen, E.R. & Olafsen, A.H. (2013). Employer branding: Employer attractiveness and the use of social media. *Journal of Product and Brand Management*, 22(7), 473-483.

Smith, K., Blazovich, J., & Smith, L. (2015). Social media adoption by corporations: An examination by platform, industry, size, and financial performance. *Academy of Marketing Studies Journal*, 19(2).

Taylor, H. (2016, April). If social networks were countries, which would they be? *World Economic Forum*. Retrieved July 1st, 2017, from https://www.weforum.org/agenda/2016/04/facebook-is-bigger-than-the-worlds-largest-country/

Tellis, G. J., Prabhu, J. C., & Chandy, R. K. (2009). Radical Innovation Across Nations: The Preeminence of Corporate Culture. *Journal of Marketing*, 73(1), 3–23.

Tiago, M. T. P. M. B., & Veríssimo, J. M. C. (2014). Digital marketing and social media: Why bother? *Business Horizons*, 57(6), 703–708.

Tirunillai, S., & Tellis, G. J. (2012). Does Chatter Really Matter? Dynamics of User-Generated Content and Stock Performance. *Marketing Science*, 31(2), 198–215.

Trainor, K. J. (2012). Relating Social Media Technologies to Performance: A Capabilities-Based Perspective. *Journal of Personal Selling & Sales Management*, *32*(3), 317–331.

Trainor, K. J., Andzulis, J. (Mick), Rapp, A., & Agnihotri, R. (2014). Social media technology usage and customer relationship performance: A capabilities-based examination of social CRM. *Journal of Business Research*, 67(6), 1201–1208.

Treem, J. W., & Leonardi, P. M. (2013). Social Media Use in Organisations: Exploring the Affordances of Visibility, Editability, Persistence, and Association. Annals of the International Communication Association, 36(1), 143–189.

Tsai, K.-H., & Yang, S.-Y. (2013). Firm innovativeness and business performance: The joint moderating effects of market turbulence and competition. *Industrial Marketing Management*, 42(8), 1279–1294.

Turban, E., Bolloju, N., & Liang, T.-P. (2011). Enterprise Social Networking: Opportunities, Adoption, and Risk Mitigation. *Journal of Organisational Computing and Electronic Commerce*, 21(3), 202–220.

Uyar, A., & Boyar, E. (2015). An Investigation into Social Media Usage of Publicly Traded Companies. *Journal of Corporate Accounting & Finance*, 27(1), 71–78.

Wamba, S. and Carter, L. (2013). Twitter adoption and use by SMEs: An empirical study. The 46 Hawaii International Conferences on System Sciences (HICSS), Maui, Hawaii, January 7-10, 2013.

Webster, J.& Watson, R. T. (2002). Analysing the past to prepare for the future: Writing a literature review. *MIS Quarterly*, 26(2), xiii-xxiii.

Weinberg, B. D., & Pehlivan, E. (2011). Social spending: Managing the social media mix. *Business Horizons*, 54(3), 275–282.

Wirtz, B. W., & Salzer, E. (2013). IPO-Management: Strukturen und Erfolgsfaktoren. Gabler Verlag. Retrieved from https://books.google.de/books?id=MmwcBgAAQBAJ

Yang, J. H., & Liu, S. (2017). Accounting narratives and impression management on social media. *Accounting and Business Research*, 47(6), 673–694.

Zhou, M. (Jamie), Lei, L. (Gillian), Wang, J., Fan, W. (Patrick), & Wang, A. G. (2015). Social Media Adoption and Corporate Disclosure. *Journal of Information Systems*, 29(2), 23–50.

Appendices

Appendix 1 – Companies Listed on the MDAX at the Time of Data Collection

Aareal Bank AG
Airbus Group SE
Alstria Office REIT-AG
Aurubis AG
Axel Springer SE
Bilfinger SE
Brenntag AG
Covestro AG
CTS EVENTIM AG & Co. KGaA
Deutsche EuroShop AG
Deutsche Pfandbriefbank AG
Deutsche Wohnen AG
Dürr AG
Evonik Industries AG
Fielmann AG
Fraport AG
Fuchs Petrolub SE
GEA Group AG
Gerresheimer AG
Hannover Rückversicherung AG
HELLA KGaA Hueck & Co.
Hochtief AG
Hugo Boss AG
Innogy
Jungheinrich AG
K+S AG
Kion Group AG
Krones AG
Lanxess AG
LEG Immobilien AG
Leoni AG
Metro Group
MTU Aero Engines AG
Norma Group SE
OSRAM Licht AG
Rational AG
Rheinmetall AG
RTL Group SA
Salzgitter AG
Schaeffler AG
STADA Arzneimittel AG
Steinhoff International Holdings N.V.
Ströer Media SE
Südzucker AG
Symrise AG
TAG Immobilien AG
Talanx AG
Uniper
Wacker Chemie AG
Zalando SE

Appendix 2 – Data Set (SmartPLS Input)

Company Name	No. of Empl.	Age	Exp_RD	Sales	R&D Ratio	Sust_ Rating	Innov_ Coop	Patent App_ 2015	Channel_ adopt	Tw_ Usage Ratio	Tw_ follower	Tw_ Likes	Retw_ Perc	Tweets _day	Tw_ hashtags	Fb_Usage Ratio	Fb_ Posts	Fb_ Likes	Fb_ followers	Fb_ React Post	Fb_ Shares Post	Fb_ Comments	Yt_ Usage Ratio	Yt_ Videos	Yt_ Subscr	Yt_ views	In_ Usage Ratio	In_ followers	In_ Posts
Zalando SE	11998	9	57700000	3639000000	0.0159	4	3	0	4	0.75	19465	1405	3.7	6.44	94	0.64	12296	4897800	4894347	180	6	16	0.54	478	49332	3627211	0.63	420000	2359
Wacker Chemie AG	17205	103	183400000	5404200000	0.0339	5	3	436	2	0.42	1985	459	34.87	1.64	3077	0	-99	-99	-99	-99	-99	0	0.38	129	1380	746393	-99	-99	-99
Uniper	12635	1	5000000	67285000000	0.0001	4	0	0	4	0.25	649	623	49.8	1.11	355	0.14	55	274	292	12	0	0	0.15	55	77	-99	0.25	53	94
Talanx AG	21649	21	0	25742000000	0.0000	3	1	0	1	0.75	1081	124	26.8	1.99	3787	0	-99	-99	-99	-99	-99	0	0	-99	-99	-99	0	-99	-99
TAG Immobilien AG	833	135	0	275193000	0.0000	3	0	0	0	0	-99	-99	-99	-99	-99	0	-99	-99	-99	-99	-99	0	0	-99	-99	-99	0	-99	-99
Symrise AG	8944	14	186125000	2903000000	0.0641	4	2	111	4	0.58	1982	9	68	0.13	692	0.5	8	73	76	1	0	0	0.46	76	363	50773	0	-99	-99
Südzucker AG	16908	91	41800000	6387000000	0.0065	3	2	14	4	0.58	128	18	2.9	0.04	79	0.21	564	10522	10494	18	4	1	0.15	7	23	-99	-99	8	0
Ströer Media SE	4577	27	-99	1123300000	-99	1	0	1	4	0.75	1356	224	12	0.27	558	0.57	894	3970	3869	8	0	0	0.54	37	161	141519	-99	34	0
Steinhoff Internat. Holdings N.V.	105866	54	-99	13427000000	-99	3	0	6	2	0	-99	-99	-99	-99	-99	0.5	20	562	570	2	0	0	0.38	9	-99	-99	0	-99	-99
STADA Arzneimittel AG	10923	122	65111	2139200000	0.0000	2	0	3	3	0.5	1255	134	26.4	0.54	771	0.57	540	17931	17774	12	2	0	0.46	141	691	1698115	0	-99	-99
Schaeffler AG	86662	71	751000000	13338000000	0.0563	5	3	3912	4	0.33	13520	1155	52.6	2.18	2337	0.5	1355	69481	69605	32	4	0	0.31	239	1106	240697	-99	399	0
Salzgitter AG	25168	19	94100000	7905700000	0.0119	1	0	55	3	0.75	1886	169	15.1	0.74	3665	0	-99	-99	-99	-99	-99	0	0.69	61	690	345429	0.38	317	42
RTL Group SA	10325	86	-99	6237000000	-99	3	2	1	4	0.5	3938	2110	24.5	3.69	1197	0.07	4548	1033907	999	68	2	15	0.31	15	50	4782	0.63	83900	224
Rheinmetall AG	20993	128	258000000	5602000000	0.0461	4	2	122	3	0.75	3260	-99	71.3	0.18	1029	0	-99	-99	-99	-99	-99	0	0.46	71	9844	2566940	-99	18	0
Rational AG	1713	44	30600000	613000000	0.0499	3	0	14	4	0.67	8148	725	21.1	7.38	1270	0.43	1952	177248	176251	22	2	1	0.62	1198	5005	1918467	0.75	9268	3676
OSRAM Licht AG	34200	111	334000000	3785000000	0.0882	3	2	1637	4	0.67	2088	1736	20.6	1.01	1523	0.43	1331	66097	66195	113	9	2	0.92	234	6059	2854592	0.25	1657	114
Norma Group SE	6664	68	28800000	894900000	0.0322	5	2	73	2	0.67	1650	143	16.2	0.77	3399	0.36	1200	25134	25074	61	1	0	0	-99	-99	-99	0	-99	-99
MTU Aero Engines AG	8368	83	208600000	4732700000	0.0441	5	0	300	3	0.67	2017	206	29.2	0.82	1848	0.57	605	10467	10300	40	3	0	0.46	96	886	172792	0	-99	-99
Metro Group	219678	21	21000000	58417000000	0.0004	5	3	80	3	0.17	1334	495	41.5	2.28	775	0.5	1687	206049	206791	95	9	7	0.23	140	9673	231387	0	-99	-99
Leoni AG	69283	100	134385000	2689700000	0.0500	3	1	119	2	0	-99	-99	-99	-99	-99	0.5	587	12443	12426	15	4	0	0.46	59	330	46578	0	-99	-99
LEG Immobilien AG	990	47	-99	763300000	-99	2	0	0	1	0	-99	-99	-99	-99	-99	0	-99	-99	-99	-99	-99	0	0.62	22	74	-99	0	-99	-99
Lanxess AG	16721	13	131000000	7699000000	0.0170	5	2	307	4	0.75	6496	532	41.6	0.56	1593	0.14	361	25296	25273	18	1	0	0.69	178	568	116958	-99	87	0
Krones AG	14443	66	171000000	2721200000	0.0628	5	0	621	4	0.75	6369	37600	54.8	8.74	2450	0.36	1111	112374	110583	499	4	3	0.62	1363	6898	3199189	0.75	4599	1108
Kion Group AG	30544	11	96500000	5587200000	0.0173	2	0	13	2	0.33	909	86	37.4	1.61	2640	0	-99	-99	-99	-99	-99	0	0.23	34	189	26731	0	-99	0
K+S AG	14446	128	13700000	1531600000	0.0089	3	2	17	2	0.75	83	-99	0	0	0	0	-99	-99	-99	-99	-99	0	0.69	58	434	76719	0	-99	-99
Jungheinrich AG	15010	64	62000000	3084849000	0.0201	4	1	99	3	0.58	4736	1900	31.3	4.78	1234	0.43	1548	26372	25984	64	8	1	0.69	256	2084	1286285	0	-99	-99

Innogy	40636	1	149000000	43611000000	0.0034	5	3	31	4	0.17	3502	957	38.5	3.33	1371	0.14	478	32814	32952	52	7	4	0.15	95	1712	5022089	0.25	1188	255
Hugo Boss AG	13798	93	64000000	2692800000	0.0238	4	1	0	4	0.67	671060	1135	89.9	1.77	5110	0.21	799	7907844	7747736	1722	118	28	0.62	101	-99	20659425	0.75	2600000	2284
Hochtief AG	51490	142	4500000	19908300000	0.0002	4	0	0	3	0.58	2381	170	11.5	1.98	3845	0.07	0	286	291	0	0	0	0.23	21	91	-99	0	-99	-99
HELLA KGaA Hueck & Co.	33689	118	623000000	6352000000	0.0981	2	0	311	3	0.08	3	0	0	0	4	0.29	526	2785	2795	19	2	0	0.46	109	3600	1051846	0	-99	-99
Hannover Rück-versicherung AG	2893	26	-99	15968505000	-99	4	1	0	2	0.75	64	0	0	0	8	0	-99	-99	-99	-99	-99	0	0.31	33	58	31296	0	-99	-99
Gerresheimer AG	9904	153	3163000	1375500000	0.0023	2	0	44	3	0.67	450	0	26.39	0.05	26	0.36	309	1174	1155	11	1	0	0.54	48	138	43003	0	-99	-99
GEA Group AG	16937	136	87800000	4599269000	0.0191	3	0	302	3	0.58	2513	347	20.11	0.81	878	0.14	92	759	786	13	3	0	0.38	239	3412	694093	0	-99	-99
Fuchs Petrolub SE	4898	86	44000000	2267000000	0.0194	2	0	8	2	0.67	-99	-99	-99	-99	-99	0.43	374	1462	1433	26	2	0	0	-99	-99	-99	0	-99	-99
Fraport AG	20322	70	-99	2586200000	-99	4	3	7	4	0.75	40000	4514	10.66	17.2	43	0.14	2174	349788	341274	179	10	6	0.46	245	7222	1964808	0.5	87	668
Fielmann AG	17549	45	-99	1549800000	-99	1	2	0	2	0	-99	-99	-99	-99	-99	0	-99	-99	-99	-99	-99	0	0.38	57	1945	17612241	1	2988	154
Evonik Industries AG	34351	10	438000000	12732000000	0.0344	5	3	1256	4	0.33	6677	2224	60.4	2.12	3871	0.5	1615	28890	28328	59	16	1	0.54	118	1852	188182	0.38	174	12
Dürr AG	15235	122	105900000	3573500000	0.0296	3	2	250	3	0.67	883	108	14.38	0.32	43	0.07	7	981	986	66	6	0	0.54	107	1183	299836	0	-99	-99
Deutsche Wohnen AG	943	93	-99	31500000	-99	5	0	0	2	0.08	9	0	14.29	0.04	0	0	-99	-99	-99	-99	-99	0	0.23	1	4	240	0	-99	-99
Deutsche Pfandbriefbank AG	756	148	7000000	508000000	0.0138	2	0	0	0	0	-99	-99	-99	-99	-99	0	-99	-99	-99	-99	-99	0	0	-99	-99	-99	0	-99	-99
Deutsche EuroShop AG	5	20	-99	205100000	-99	2	0	0	3	0.75	896	24	3.09	1.04	438	0.57	749	245	240	1	0	0	0.62	36	32	33180	0	-99	-99
CTS EVENTIM AG & Co. KGaA	2384	18	0	829906000	0.0000	1	0	0	3	0	-99	-99	-99	-99	-99	0.29	5049	532966	52245	75	6	49	0.15	3	21	60635	0.38	31200000	633
Covestro AG	15761	2	259000000	11904000000	0.0218	5	2	466	3	0.67	11600	6100	37.34	6.2	1847	0.43	499	19050	18918	56	10	1	0.23	164	390	152938	0	-99	-99
Brenntag AG	14826	143	-99	10498400000	-99	5	0	0	3	0.08	308	50	38.69	0.8	49	0.07	108	1200	1296	51	9	1	0.08	8	87	6966	0	-99	-99
Bilfinger SE	39946	137	7400000	4249000000	0.0017	5	2	22	4	0.75	3	234	41.2	0.71	1025	0.43	319	5860	5839	30	2	0	0.54	85	850	13717	-99	211	0
Axel Springer SE	15323	71	-99	3290200000	-99	3	3	0	4	0.75	2	2	53.8	0.2	323	0.21	750	11908	11461	15	1	0	0.62	151	689	433788	0.38	1617	660
Aurubis AG	6454	151	13000000	9475000000	0.0014	5	1	22	4	0.17	453	505	18.6	1.07	393	0.5	572	2260	2228	22	2	1	0.54	24	85	21928	0.25	214	115
Alstria Office REIT-AG	114	11	-99	202663000	-99	4	0	0	2	0.67	1817	7	32.4	1.12	2777	0	-99	-99	-99	-99	-99	0	0.62	25	13	7307	0	-99	-99
Airbus Group SE	133782	17	2147000000	66600000000	0.0322	2	3	118	4	0.83	485964	2910	62.1	4	2377	0.43	1429	1575138	1571481	4293	526	95	0.54	683	212046	46630631	0.63	1000000	467
Aareal Bank AG	2728	94	-99	1416500000	-99	5	1	0	4	0.75	481	246	60.96	0.36	5	0.3571	3	75	76	1	1	0	0.2308	16	7	659	0	2	0

Appendix 3 – Overview of Significant Path Relationships

Model No.	Channels included	Control Variables Included	Path Relationship	Path Coefficient	T Statistic	p-Value
1	all	*none*	Innovativeness → Speed SM	0.345	1.722	0.086
1	all	*none*	Sustainability Orientation → Scope SM	0.432	2.1	0.036
1	all	*none*	Sustainability Orientation → Success SM	0.296	1.858	0.064
2.1	all	Firm age Firm Size (Sales)	Firm Age → Scope SM	-0.253	1.953	0.051
2.1	all	Firm age Firm Size (Sales)	Firm Age → Speed SM	-0.255	1.686	0.092
2.1	all	Firm age Firm Size (Sales)	Sustainability Orientation → Scope SM	0.379	1.86	0.064
3	Facebook	*none*	Sustainability Orientation → Speed SM	0.309	2.202	0.028
5	YouTube	*none*	Innovativeness → Scope SM	0.27	1.976	0.049
5	YouTube	*none*	Innovativeness → Speed SM	0.387	2.349	0.019

Appendix 4 – SmartPLS Reports Main Model (selected results)

Main Model without Control Variables (Model 1)

Path Coefficients

Mean, STDEV, T-Values, P-Values

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
Innovativeness -> Scope of SM	0.197	0.266	0.144	1.369	0.172
Innovativeness -> Speed of SM	0.345	0.403	0.201	1.722	0.086
Innovativeness -> Success of SM	0.116	0.221	0.175	0.664	0.507
SO -> Scope of SM	0.432	0.370	0.206	2.100	0.036
SO -> Speed of SM	0.114	0.102	0.237	0.483	0.630
SO -> Success of SM	0.296	0.232	0.160	1.858	0.064

R Square

	R Square	R Square Adjusted
Scope of SM	0.320	0.292
Speed of SM	0.158	0.122
Success of SM	0.180	0.145

Discriminant Validity

Fornell-Larcker Criterion

	Innovativeness	Sustainability Orientation	Scope of SM	Speed of SM	Success of SM
Innovativeness	0.753				
SO	0.480	1.000			
Scope of SM	0.406	0.541	0.632		
Speed of SM	0.384	0.274	0.735	0.648	
Success of SM	0.294	0.409	0.382	0.350	0.681

Collinearity Statistics (VIF)

Outer VIF Values

	VIF
Channels_adopt	1.206
Fb_Comments	-4.745
Fb_Followers	-2.747
Fb_Posts	2.432
Fb_ReactPost	-250.582
Fb_SharesPost	-218.698
Fb_UsageRatio	1.069
In_Followers	-0.620
In_Posts	6.775
In_UsageRatio	1.114
Innov_Coop	1.120
PatentApp_2015	1.523
R&D Ratio	1.382
Retw_Perc	1.409
Sust_Rating	1.000
Tw_Likes	-1.883
Tw_UsageRatio	1.188
Tw_follower	-12.443
Tw_hashtags	1.330
Tweets_day	1.769
Yt_Subscr	-21.334
Yt_UsageRatio	1.349
Yt_Videos	5.818
Yt_views	-44.562

Outer Loadings

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
Channels_adopt <- Scope of SM	0.826	0.715	0.224	3.692	0.000
Fb_Comments <- Success of SM	0.429	0.396	0.359	1.196	0.232
Fb_Followers <- Success of SM	0.456	0.491	0.220	2.070	0.039
Fb_Posts <- Scope of SM	0.264	0.269	0.310	0.851	0.395
Fb_ReactPost <- Success of SM	0.768	0.729	0.221	3.467	0.001
Fb_SharesPost <- Success of SM	0.701	0.670	0.239	2.926	0.004
Fb_UsageRatio <- Speed of SM	0.592	0.507	0.262	2.260	0.024
In_Followers <- Success of SM	-0.435	-0.026	0.652	0.668	0.504
In_Posts <- Scope of SM	0.513	0.482	0.306	1.676	0.094
In_UsageRatio <- Speed of SM	0.586	0.566	0.299	1.959	0.051
Innov_Coop <- Innovativeness	0.672	0.659	0.236	2.844	0.005
PatentApp_2015 <- Innovativeness	0.682	0.662	0.154	4.438	0.000
R&D Ratio <- Innovativeness	0.746	0.663	0.296	2.522	0.012
Retw_Perc <- Success of SM	0.676	0.545	0.206	3.282	0.001
Sust_Rating <- SO	1.000	1.000	0.000		
Tw_Likes <- Success of SM	0.367	0.454	0.183	2.001	0.046
Tw_UsageRatio <- Speed of SM	0.548	0.511	0.257	2.131	0.034
Tw_follower <- Success of SM	0.671	0.634	0.217	3.097	0.002
Tw_hashtags <- Success of SM	0.388	0.334	0.207	1.871	0.062
Tweets_day <- Scope of SM	0.616	0.585	0.185	3.338	0.001
Yt_Subscr <- Success of SM	0.586	0.563	0.254	2.306	0.022
Yt_UsageRatio <- Speed of SM	0.784	0.685	0.229	3.419	0.001
Yt_Videos <- Scope of SM	0.672	0.639	0.203	3.306	0.001
Yt_views <- Success of SM	0.711	0.623	0.266	2.674	0.008

Outer Weights

Mean, STDEV, T-Values, P-Values

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
Channels_adopt <- Scope of SM	0.696	0.580	0.238	2.918	0.004
Fb_Comments <- Success of SM	0.035	0.034	0.114	0.308	0.758
Fb_Followers <- Success of SM	0.079	0.074	0.053	1.492	0.136
Fb_Posts <- Scope of SM	0.001	0.013	0.228	0.003	0.997
Fb_ReactPost <- Success of SM	0.118	0.112	0.045	2.641	0.009
Fb_SharesPost <- Success of SM	0.102	0.102	0.057	1.792	0.074
Fb_UsageRatio <- Speed of SM	0.426	0.344	0.219	1.946	0.052
In_Followers <- Success of SM	-0.435	-0.224	0.234	1.858	0.064
In_Posts <- Scope of SM	0.008	0.002	0.195	0.041	0.968
In_UsageRatio <- Speed of SM	0.386	0.378	0.254	1.521	0.129
Innov_Coop <- Innovativeness	0.539	0.528	0.237	2.269	0.024
PatentApp_2015 <- Innovativeness	0.305	0.303	0.131	2.333	0.020
R&D Ratio <- Innovativeness	0.537	0.435	0.238	2.256	0.024
Retw_Perc <- Success of SM	0.415	0.295	0.145	2.873	0.004
Sust_Rating <- SO	1.000	1.000	0.000		
Tw_Likes <- Success of SM	0.235	0.238	0.118	1.997	0.046
Tw_UsageRatio <- Speed of SM	0.251	0.249	0.189	1.326	0.186
Tw_follower <- Success of SM	0.093	0.089	0.057	1.615	0.107
Tw_hashtags <- Success of SM	0.058	0.063	0.123	0.471	0.638
Tweets_day <- Scope of SM	0.278	0.258	0.080	3.486	0.001
Yt_Subscr <- Success of SM	0.133	0.138	0.092	1.455	0.146
Yt_UsageRatio <- Speed of SM	0.476	0.399	0.193	2.466	0.014
Yt_Videos <- Scope of SM	0.336	0.316	0.128	2.638	0.009
Yt_views <- Success of SM	0.062	0.055	0.095	0.652	0.515

Main Model including Control Variables (Model 2)

Model 2.1 – *Sales* as a Proxy for Firm Size

Path Coefficients

Mean, STDEV, T-Values, P-Values

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
Firm Age -> Scope of SM	-0.253	-0.226	0.129	1.953	0.051
Firm Age -> Speed of SM	-0.255	-0.249	0.151	1.686	0.092
Firm Age -> Success of SM	0.040	-0.007	0.131	0.306	0.760
Firm Size -> Scope of SM	-0.093	-0.073	0.160	0.577	0.564
Firm Size -> Speed of SM	-0.264	-0.261	0.193	1.368	0.172
Firm Size -> Success of SM	0.442	0.311	0.317	1.393	0.164
Innovativeness -> Scope of SM	0.150	0.193	0.155	0.973	0.331
Innovativeness -> Speed of SM	0.280	0.294	0.206	1.360	0.174
Innovativeness -> Success of SM	0.184	0.192	0.196	0.935	0.350
SO -> Scope of SM	0.379	0.305	0.204	1.860	0.064
SO -> Speed of SM	0.205	0.211	0.217	0.946	0.345
SO -> Success of SM	-0.093	0.021	0.234	0.396	0.692

R Square

	R Square	R Square Adjusted
Scope SM	0.207	0.137
Speed SM	0.231	0.163
Success SM	0.334	0.274

Discriminant Validity

Fornell-Larcker Criterion

	Firm Age	Firm Size	Innovativeness	Scope SM	Speed SM	Success SM	Sustainability Orientation
Firm Age	1.000						
Firm Size	-0.374	1.000					
Innovativeness	-0.113	0.066	0.738				
Scope SM	-0.281	0.101	0.374	0.725			
Speed SM	-0.195	-0.098	0.390	0.703	0.651		
Success SM	-0.165	0.476	0.157	0.237	0.291	0.789	
Sustainability Orientation	0.031	0.165	0.346	0.198	-0.036	-0.151	1.000

Collinearity Statistics (VIF)

Outer VIF Values

	VIF
Age	1.000
Channels_adopt	1.206
Fb_Comments	-4.745
Fb_Followers	-2.747
Fb_Posts	2.432
Fb_ReactPost	-250.582
Fb_SharesPost	-218.698
Fb_UsageRatio	1.069
In_Followers	-0.620
In_Posts	6.775
In_UsageRatio	1.114
Innov_Coop	1.120
PatentApp_2015	1.523
R&D Ratio	1.382
Retw_Perc	1.409
Sales	1.000
Sust_Rating	1.000
Tw_Likes	-1.883
Tw_UsageRatio	1.188
Tw_follower	-12.443
Tw_hashtags	1.330
Tweets_day	1.769
Yt_Subscr	-21.334
Yt_UsageRatio	1.349
Yt_Videos	5.818
Yt_views	-44.562

Outer Loadings

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
Age <- Firm Age	1.000	1.000	0.000		
Channels_adopt <- Scope of SM	0.695	0.554	0.237	2.932	0.004
Fb_Comments <- Success of SM	0.750	0.551	0.356	2.104	0.036
Fb_Followers <- Success of SM	0.428	0.489	0.237	1.805	0.072
Fb_Posts <- Scope of SM	0.456	0.442	0.277	1.650	0.100
Fb_ReactPost <- Success of SM	0.982	0.825	0.254	3.869	0.000
Fb_SharesPost <- Success of SM	0.975	0.787	0.280	3.477	0.001
Fb_UsageRatio <- Speed of SM	0.544	0.499	0.209	2.600	0.010
In_Followers <- Success of SM	-0.011	0.223	0.581	0.018	0.985
In_Posts <- Scope of SM	0.658	0.650	0.292	2.256	0.025
In_UsageRatio <- Speed of SM	0.587	0.559	0.250	2.349	0.019
Innov_Coop <- Innovativeness	0.717	0.665	0.254	2.819	0.005
PatentApp_2015 <- Innovativeness	0.641	0.648	0.149	4.286	0.000
R&D Ratio <- Innovativeness	0.719	0.674	0.249	2.891	0.004
Retw_Perc <- Success of SM	0.385	0.392	0.186	2.078	0.038
Sales <- Firm Size	1.000	1.000	0.000		
Sust_Rating <- SO	1.000	1.000	0.000		
Tw_Likes <- Success of SM	0.065	0.279	0.253	0.258	0.796
Tw_UsageRatio <- Speed of SM	0.608	0.606	0.181	3.350	0.001
Tw_follower <- Success of SM	0.753	0.691	0.232	3.253	0.001
Tw_hashtags <- Success of SM	0.269	0.283	0.161	1.671	0.095
Tweets_day <- Scope of SM	0.678	0.650	0.160	4.232	0.000
Yt_Subscr <- Success of SM	0.858	0.671	0.308	2.781	0.006
Yt_UsageRatio <- Speed of SM	0.788	0.746	0.145	5.422	0.000
Yt_Videos <- Scope of SM	0.677	0.666	0.166	4.074	0.000
Yt_views <- Success of SM	0.912	0.708	0.312	2.928	0.004

Outer Weights

Mean, STDEV, T-Values, P-Values

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
Age <- Firm Age	1.000	1.000	0.000		
Channels_adopt <- Scope of SM	0.549	0.403	0.242	2.263	0.024
Fb_Comments <- Success of SM	0.140	0.084	0.104	1.351	0.177
Fb_Followers <- Success of SM	-0.011	0.045	0.070	0.150	0.881
Fb_Posts <- Scope of SM	0.178	0.152	0.201	0.887	0.375
Fb_ReactPost <- Success of SM	0.178	0.145	0.055	3.233	0.001
Fb_SharesPost <- Success of SM	0.198	0.151	0.066	2.989	0.003
Fb_UsageRatio <- Speed of SM	0.370	0.316	0.159	2.326	0.020
In_Followers <- Success of SM	-0.077	-0.054	0.196	0.391	0.696
In_Posts <- Scope of SM	0.102	0.125	0.194	0.525	0.600
In_UsageRatio <- Speed of SM	0.382	0.352	0.200	1.909	0.057
Innov_Coop <- Innovativeness	0.604	0.546	0.255	2.364	0.018
PatentApp_2015 <- Innovativeness	0.243	0.282	0.147	1.654	0.099
R&D Ratio <- Innovativeness	0.537	0.448	0.217	2.478	0.014
Retw_Perc <- Success of SM	0.087	0.132	0.132	0.657	0.512
Sales <- Firm Size	1.000	1.000	0.000		
Sust_Rating <- SO	1.000	1.000	0.000		
Tw_Likes <- Success of SM	-0.014	0.087	0.127	0.108	0.914
Tw_UsageRatio <- Speed of SM	0.324	0.330	0.140	2.319	0.021
Tw_follower <- Success of SM	0.085	0.101	0.068	1.254	0.210
Tw_hashtags <- Success of SM	0.023	0.053	0.083	0.283	0.778
Tweets_day <- Scope of SM	0.313	0.282	0.081	3.854	0.000
Yt_Subscr <- Success of SM	0.193	0.156	0.109	1.768	0.078
Yt_UsageRatio <- Speed of SM	0.466	0.432	0.142	3.276	0.001
Yt_Videos <- Scope of SM	0.289	0.292	0.110	2.630	0.009
Yt_views <- Success of SM	0.177	0.109	0.093	1.897	0.058

Model 2.2 – *Employees* as a Proxy for Firm Size

Path Coefficients

Mean, STDEV, T-Values, P-Values

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
Firm Age -> Scope of SM	-0.227	-0.215	0.098	2.328	0.020
Firm Age -> Speed of SM	-0.184	-0.179	0.142	1.295	0.196
Firm Age -> Success of SM	-0.107	-0.100	0.102	1.056	0.292
Firm Size -> Scope of SM	-0.083	-0.072	0.118	0.705	0.481
Firm Size -> Speed of SM	-0.155	-0.172	0.208	0.741	0.459
Firm Size -> Success of SM	0.282	0.226	0.245	1.151	0.250
Innovativeness -> Scope of SM	0.189	0.247	0.149	1.267	0.206
Innovativeness -> Speed of SM	0.356	0.392	0.202	1.762	0.079
Innovativeness -> Success of SM	0.039	0.117	0.200	0.196	0.845
SO -> Scope of SM	0.373	0.295	0.193	1.928	0.054
SO -> Speed of SM	0.121	0.103	0.214	0.563	0.574
SO -> Success of SM	0.058	0.118	0.178	0.326	0.745

R Square

	R Square	R Square Adjusted
Scope of SM	0.327	0.267
Speed of SM	0.202	0.131
Success of SM	0.165	0.091

Discriminant Validity

Fornell-Larcker Criterion

	Firm Age	Firm Size	Innovativeness	Sustainability Orientation	Scope of SM	Speed of SM	Success of SM
Firm Age	1.000						
Firm Size	-0.156	1.000					
Innovativeness	-0.115	0.305	0.737				
SO	-0.012	0.219	0.501	1.000			
Scope of SM	-0.260	0.096	0.396	0.484	0.689		
Speed of SM	-0.206	0.003	0.380	0.264	0.749	0.654	
Success of SM	-0.182	0.375	0.191	0.162	0.265	0.329	0.793

Collinearity Statistics (VIF)

Outer VIF Values

	VIF
Age	1.000
Channels_adopt	1.206
Employees	1.000
Fb_Comments	-4.745
Fb_Followers	-2.747
Fb_Posts	2.432
Fb_ReactPost	-250.582
Fb_SharesPost	-218.698
Fb_UsageRatio	1.069
In_Followers	-0.620
In_Posts	6.775
In_UsageRatio	1.114
Innov_Coop	1.120
PatentApp_2015	1.523
R&D Ratio	1.382
Retw_Perc	1.409
Sust_Rating	1.000
Tw_Likes	-1.883
Tw_UsageRatio	1.188
Tw_follower	-12.443
Tw_hashtags	1.330
Tweets_day	1.769
Yt_Subscr	-21.334
Yt_UsageRatio	1.349
Yt_Videos	5.818
Yt_views	-44.562

Outer Loadings

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
Age <- Firm Age	1.000	1.000	0.000		
Channels_adopt <- Scope of SM	0.726	0.606	0.211	3.446	0.001
Employees <- Firm Size	1.000	1.000	0.000		
Fb_Comments <- Success of SM	0.741	0.513	0.367	2.020	0.044
Fb_Followers <- Success of SM	0.468	0.497	0.213	2.193	0.029
Fb_Posts <- Scope of SM	0.437	0.468	0.241	1.812	0.071
Fb_ReactPost <- Success of SM	0.980	0.811	0.243	4.040	0.000
Fb_SharesPost <- Success of SM	0.958	0.766	0.264	3.634	0.000
Fb_UsageRatio <- Speed of SM	0.461	0.372	0.342	1.349	0.178
In_Followers <- Success of SM	-0.002	0.157	0.588	0.004	0.997
In_Posts <- Scope of SM	0.629	0.633	0.250	2.516	0.012
In_UsageRatio <- Speed of SM	0.667	0.617	0.237	2.809	0.005
Innov_Coop <- Innovativeness	0.740	0.684	0.252	2.939	0.003
PatentApp_2015 <- Innovativeness	0.638	0.627	0.186	3.425	0.001
R&D Ratio <- Innovativeness	0.696	0.626	0.324	2.150	0.032
Retw_Perc <- Success of SM	0.458	0.436	0.197	2.329	0.020
Sust_Rating <- SO	1.000	1.000	0.000		
Tw_Likes <- Success of SM	0.121	0.333	0.240	0.505	0.614
Tw_UsageRatio <- Speed of SM	0.622	0.596	0.229	2.721	0.007
Tw_follower <- Success of SM	0.780	0.686	0.228	3.430	0.001
Tw_hashtags <- Success of SM	0.343	0.311	0.169	2.031	0.043
Tweets_day <- Scope of SM	0.671	0.666	0.117	5.735	0.000
Yt_Subscr <- Success of SM	0.832	0.648	0.287	2.893	0.004
Yt_UsageRatio <- Speed of SM	0.754	0.664	0.210	3.585	0.000
Yt_Videos <- Scope of SM	0.675	0.684	0.123	5.497	0.000
Yt_views <- Success of SM	0.907	0.682	0.308	2.944	0.003

Outer Weights

Mean, STDEV, T-Values, P-Values

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
Age <- Firm Age	1.000	1.000	0.000		
Channels_adopt <- Scope of SM	0.582	0.450	0.213	2.733	0.006
Employees <- Firm Size	1.000	1.000	0.000		
Fb_Comments <- Success of SM	0.141	0.076	0.111	1.276	0.203
Fb_Followers <- Success of SM	0.016	0.059	0.065	0.246	0.806
Fb_Posts <- Scope of SM	0.165	0.171	0.181	0.908	0.364
Fb_ReactPost <- Success of SM	0.165	0.139	0.053	3.108	0.002
Fb_SharesPost <- Success of SM	0.179	0.142	0.063	2.864	0.004
Fb_UsageRatio <- Speed of SM	0.291	0.207	0.281	1.037	0.300
In_Followers <- Success of SM	-0.072	-0.085	0.212	0.337	0.736
In_Posts <- Scope of SM	0.073	0.086	0.173	0.422	0.673
In_UsageRatio <- Speed of SM	0.477	0.429	0.200	2.385	0.017
Innov_Coop <- Innovativeness	0.628	0.561	0.264	2.381	0.018
PatentApp_2015 <- Innovativeness	0.242	0.269	0.155	1.559	0.120
R&D Ratio <- Innovativeness	0.512	0.414	0.259	1.978	0.048
Retw_Perc <- Success of SM	0.141	0.170	0.144	0.984	0.325
Sust_Rating <- SO	1.000	1.000	0.000		
Tw_Likes <- Success of SM	0.028	0.127	0.134	0.212	0.832
Tw_UsageRatio <- Speed of SM	0.361	0.353	0.198	1.828	0.068
Tw_follower <- Success of SM	0.091	0.103	0.067	1.365	0.173
Tw_hashtags <- Success of SM	0.076	0.067	0.088	0.859	0.391
Tweets_day <- Scope of SM	0.307	0.285	0.075	4.124	0.000
Yt_Subscr <- Success of SM	0.189	0.163	0.104	1.812	0.071
Yt_UsageRatio <- Speed of SM	0.411	0.351	0.169	2.428	0.016
Yt_Videos <- Scope of SM	0.296	0.304	0.107	2.757	0.006
Yt_views <- Success of SM	0.148	0.092	0.091	1.623	0.105

Appendix 5 – SmartPLS Reports Model 3 (Facebook only)

Path Coefficients

Mean, STDEV, T-Values, P-Values

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
Innovativeness -> Scope of SM	0.316	0.228	0.224	1.408	0.160
Innovativeness -> Speed of SM	-0.131	0.141	0.202	0.650	0.516
Innovativeness -> Success of SM	0.246	0.160	0.251	0.981	0.327
SO -> Scope of SM	-0.172	-0.169	0.104	1.646	0.100
SO -> Speed of SM	0.309	0.210	0.141	2.202	0.028
SO -> Success of SM	-0.042	0.008	0.124	0.339	0.735

R Square

	R Square	R Square Adjusted
Scope of SM	0.110	0.072
Speed of SM	0.078	0.039
Success of SM	0.067	0.027

Discriminant Validity

Fornell-Larcker Criterion

	Innovativeness	SO	Scope of SM	Speed of SM	Success of SM
Innovativeness	0.562				
SO	0.426	1.000			
Scope of SM	0.278	-0.045	1.162		
Speed of SM	0.002	0.254	0.150	1.000	
Success of SM	0.255	0.070	0.280	0.081	0.912

Collinearity Statistics (VIF)

Outer VIF Values

	VIF
Fb_Comments	-48.690
Fb_Followers	0.323
Fb_Posts	1.000
Fb_SharesPost	-44.125
Fb_UsageRatio	1.000
Innov_Coop	1.120
PatentApp_2015	1.523
R&D Ratio	1.382
Sust_Rating	1.000

Outer Loadings

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
Fb_Comments <- Success of SM	0.828	0.687	0.326	2.539	0.011
Fb_Followers <- Success of SM	0.624	0.692	0.305	2.042	0.042
Fb_Posts <- Scope of SM	1.000	1.000	0.000		
Fb_SharesPost <- Success of SM	0.938	0.836	0.281	3.337	0.001
Fb_UsageRatio <- Speed of SM	1.000	1.000	0.000		
Innov_Coop <- Innovativeness	0.919	0.614	0.455	2.018	0.044
PatentApp_2015 <- Innovativeness	0.005	0.462	0.354	0.015	0.988
R&D Ratio <- Innovativeness	-0.287	0.396	0.491	0.584	0.559
Sust_Rating <- SO	1.000	1.000	0.000		

Outer Weights

Mean, STDEV, T-Values, P-Values

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
Fb_Comments <- Success of SM	0.410	0.310	0.350	1.171	0.242
Fb_Followers <- Success of SM	0.317	0.346	0.267	1.190	0.235
Fb_Posts <- Scope of SM	1.000	1.000	0.000		
Fb_SharesPost <- Success of SM	0.429	0.379	0.253	1.699	0.090
Fb_UsageRatio <- Speed of SM	1.000	1.000	0.000		
Innov_Coop <- Innovativeness	1.003	0.516	0.508	1.975	0.049
PatentApp_2015 <- Innovativeness	-0.208	0.205	0.298	0.696	0.487
R&D Ratio <- Innovativeness	-0.272	0.219	0.341	0.798	0.425
Sust_Rating <- SO	1.000	1.000	0.000		

Appendix 6 – SmartPLS Reports Model 4 (Twitter only)

Path Coefficients

Mean, STDEV, T-Values, P-Values

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
Innovativeness -> Scope of SM	0.111	0.165	0.148	0.752	0.452
Innovativeness -> Speed of SM	0.098	0.128	0.179	0.548	0.584
Innovativeness -> Success of SM	0.020	0.296	0.266	0.074	0.941
SO -> Scope of SM	0.134	0.125	0.117	1.140	0.255
SO -> Speed of SM	0.160	0.144	0.177	0.904	0.366
SO -> Success of SM	0.204	0.112	0.170	1.198	0.232

R Square

	R Square	R Square Adjusted
Scope of SM	0.050	0.010
Speed of SM	0.048	0.008
Success of SM	0.056	0.016

Discriminant Validity

Fornell-Larcker Criterion

	Innovativeness	SO	Scope of SM	Speed of SM	Success of SM
Innovativeness	0.735				
SO	0.493	1.000			
Scope of SM	0.185	0.202	1.091		
Speed of SM	0.170	0.205	0.125	1.000	
Success of SM	0.132	0.237	0.431	0.167	0.697

Collinearity Statistics (VIF)

Outer VIF Values

	VIF
Innov_Coop	1.120
PatentApp_2015	1.523
R&D Ratio	1.382
Sust_Rating	1.000
Tw_Likes	1.021
Tw_UsageRatio	1.000
Tw_follower	1.209
Tw_hashtags	1.232
Tweets_day	1.000

Outer Loadings

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
Innov_Coop <- Innovativeness	0.723	0.516	0.429	1.685	0.093
PatentApp_2015 <- Innovativeness	0.599	0.567	0.318	1.884	0.060
R&D Ratio <- Innovativeness	0.726	0.533	0.477	1.522	0.129
Sust_Rating <- SO	1.000	1.000	0.000		
Tw_Likes <- Success of SM	0.886	0.830	0.264	3.354	0.001
Tw_UsageRatio <- Speed of SM	1.000	1.000	0.000		
Tw_follower <- Success of SM	0.450	0.330	0.316	1.423	0.155
Tw_hashtags <- Success of SM	0.438	0.378	0.345	1.268	0.206
Tweets_day <- Scope of SM	1.000	1.000	0.000		

Outer Weights

Mean, STDEV, T-Values, P-Values

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
Innov_Coop <- Innovativeness	0.626	0.405	0.439	1.426	0.154
PatentApp_2015 <- Innovativeness	0.180	0.287	0.286	0.631	0.528
R&D Ratio <- Innovativeness	0.574	0.312	0.397	1.446	0.149
Sust_Rating <- SO	1.000	1.000	0.000		
Tw_Likes <- Success of SM	0.856	0.737	0.287	2.982	0.003
Tw_UsageRatio <- Speed of SM	1.000	1.000	0.000		
Tw_follower <- Success of SM	0.364	0.159	0.251	1.450	0.148
Tw_hashtags <- Success of SM	0.175	0.235	0.324	0.540	0.589
Tweets_day <- Scope of SM	1.000	1.000	0.000		

Appendix 7 – SmartPLS Reports Model 5 (YouTube only)

Path Coefficients

Mean, STDEV, T-Values, P-Values

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
Innovativeness -> Scope of SM	0.270	0.352	0.136	1.976	0.049
Innovativeness -> Speed of SM	0.387	0.396	0.165	2.349	0.019
Innovativeness -> Success of SM	0.051	0.127	0.181	0.282	0.778
SO -> Scope of SM	0.133	0.098	0.113	1.179	0.239
SO -> Speed of SM	0.033	0.026	0.155	0.214	0.831
SO -> Success of SM	0.065	0.017	0.161	0.406	0.685

R Square

	R Square	R Square Adjusted
Scope of SM	0.105	0.067
Speed of SM	0.125	0.088
Success of SM	0.010	-0.032

Discriminant Validity

Fornell-Larcker Criterion

	Innovativeness	SO	Scope of SM	Speed of SM	Success of SM
Innovativeness	0.772				
SO	0.331	1.000			
Scope of SM	0.297	0.223	1.054		
Speed of SM	0.352	0.146	0.247	1.000	
Success of SM	0.073	0.088	0.341	0.086	1.049

Collinearity Statistics (VIF)

Outer VIF Values

	VIF
Innov_Coop	1.120
PatentApp_2015	1.523
R&D Ratio	1.382
Sust_Rating	1.000
Yt_Subscr	5.972
Yt_UsageRatio	1.000
Yt_Videos	1.000
Yt_views	5.972

Outer Loadings

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
Innov_Coop <- Innovativeness	0.339	0.370	0.330	1.025	0.306
PatentApp_2015 <- Innovativeness	0.623	0.632	0.146	4.257	0.000
R&D Ratio <- Innovativeness	0.940	0.862	0.171	5.511	0.000
Sust_Rating <- SO	1.000	1.000	0.000		
Yt_Subscr <- Success of SM	0.970	0.778	0.423	2.292	0.022
Yt_UsageRatio <- Speed of SM	1.000	1.000	0.000		
Yt_Videos <- Scope of SM	1.000	1.000	0.000		
Yt_views <- Success of SM	0.935	0.759	0.386	2.425	0.016

Outer Weights

Mean, STDEV, T-Values, P-Values

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
Innov_Coop <- Innovativeness	0.204	0.235	0.307	0.664	0.507
PatentApp_2015 <- Innovativeness	0.255	0.279	0.145	1.757	0.079
R&D Ratio <- Innovativeness	0.789	0.652	0.200	3.951	0.000
Sust_Rating <- SO	1.000	1.000	0.000		
Yt_Subscr <- Success of SM	0.740	0.497	0.621	1.192	0.234
Yt_UsageRatio <- Speed of SM	1.000	1.000	0.000		
Yt_Videos <- Scope of SM	1.000	1.000	0.000		
Yt_views <- Success of SM	0.277	0.434	0.522	0.532	0.595

Appendix 8 – SmartPLS Reports Model 6 (Instagram only)

Path Coefficients

Mean, STDEV, T-Values, P-Values

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
Innovativeness -> Scope of SM	-0.080	-0.051	0.196	0.409	0.682
Innovativeness -> Speed of SM	0.294	0.295	0.193	1.525	0.128
Innovativeness -> Success of SM	-0.082	-0.065	0.108	0.758	0.449
SO -> Scope of SM	0.055	0.056	0.096	0.574	0.566
SO -> Speed of SM	-0.043	-0.036	0.199	0.216	0.829
SO -> Success of SM	-0.166	-0.124	0.140	1.189	0.235

R Square

	R Square	R Square Adjusted
Scope of SM	0.009	-0.033
Speed of SM	0.079	0.040
Success of SM	0.102	0.064

Discriminant Validity

Fornell-Larcker Criterion

	Innovativeness	SO	Scope of SM	Speed of SM	Success of SM
Innovativeness	0.728				
SO	0.515	1.000			
Scope of SM	-0.069	0.023	1.443		
Speed of SM	0.278	0.109	0.407	1.078	
Success of SM	-0.240	-0.304	0.054	0.009	1.474

Collinearity Statistics (VIF)

Outer VIF Values

	VIF
ln_Followers	1.000
ln_Posts	1.000
ln_UsageRatio	1.000
Innov_Coop	1.120
PatentApp_2015	1.523
R&D Ratio	1.382
Sust_Rating	1.000

Outer Loadings

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
ln_Followers <- Success of SM	1.000	1.000	0.000		
ln_Posts <- Scope of SM	1.000	1.000	0.000		
ln_UsageRatio <- Speed of SM	1.000	1.000	0.000		
Innov_Coop <- Innovativeness	0.787	0.692	0.323	2.439	0.015
PatentApp_2015 <- Innovativeness	0.640	0.547	0.265	2.417	0.016
R&D Ratio <- Innovativeness	0.638	0.514	0.393	1.625	0.105
Sust_Rating <- SO	1.000	1.000	0.000		

Outer Weights

Mean, STDEV, T-Values, P-Values

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
ln_Followers <- Success of SM	1.000	1.000	0.000		
ln_Posts <- Scope of SM	1.000	1.000	0.000		
ln_UsageRatio <- Speed of SM	1.000	1.000	0.000		
Innov_Coop <- Innovativeness	0.676	0.586	0.310	2.183	0.030
PatentApp_2015 <- Innovativeness	0.256	0.218	0.278	0.920	0.358
R&D Ratio <- Innovativeness	0.442	0.324	0.402	1.099	0.272
Sust_Rating <- SO	1.000	1.000	0.000		

Appendix 9 – SmartPLS Reports of Additional Models

Appendix 9.1 – Innovativeness Only

Path Coefficients

Mean, STDEV, T-Values, P-Values

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
Innovativeness -> Scope SM	0.427	0.487	0.103	4.153	0.000
Innovativeness -> Speed SM	0.402	0.473	0.106	3.074	0.000
Innovativeness -> Success SM	0.247	0.330	0.236	1.046	0.296

R Square

	R Square	R Square Adjusted
Scope SM	0.170	0.153
Speed SM	0.149	0.131
Success SM	0.075	0.055

Discriminant Validity

Fornell-Larcker Criterion

	Innovativeness	Scope SM	Speed SM	Success SM
Innovativeness	0.747			
Scope SM	0.413	0.664		
Speed SM	0.385	0.732	0.648	
Success SM	0.273	0.347	0.350	0.735

Collinearity Statistics (VIF)

Outer VIF Values

	VIF
Channels_adopt	1.206
Fb_Comments	-4.745
Fb_Followers	-2.747
Fb_Posts	2.432
Fb_ReactPost	-250.582
Fb_SharesPost	-218.698
Fb_UsageRatio	1.069
In_Followers	-0.620
In_Posts	6.775
In_UsageRatio	1.114
Innov_Coop	1.120
PatentApp_2015	1.523
R&D Ratio	1.382
Retw_Perc	1.409
Tw_Likes	-1.883
Tw_UsageRatio	1.188
Tw_follower	-12.443
Tw_hashtags	1.330
Tweets_day	1.769
Yt_Subscr	-21.334
Yt_UsageRatio	1.349
Yt_Videos	5.818
Yt_views	-44.562

Outer Loadings

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
Channels_adopt <- Scope SM	0.778	0.661	0.191	4.066	0.000
Fb_Comments <- Success SM	0.542	0.364	0.411	1.316	0.189
Fb_Followers <- Success SM	0.423	0.376	0.343	1.233	0.218
Fb_Posts <- Scope SM	0.421	0.402	0.269	1.565	0.118
Fb_ReactPost <- Success SM	0.873	0.624	0.391	2.235	0.026
Fb_SharesPost <- Success SM	0.832	0.577	0.406	2.049	0.041
Fb_UsageRatio <- Speed SM	0.561	0.510	0.226	2.487	0.013
In_Followers <- Success SM	-0.369	-0.022	0.598	0.617	0.537
In_Posts <- Scope SM	0.561	0.468	0.375	1.496	0.135
In_UsageRatio <- Speed SM	0.620	0.607	0.206	3.008	0.003
Innov_Coop <- Innovativeness	0.702	0.640	0.300	2.343	0.020
PatentApp_2015 <- Innovativeness	0.675	0.650	0.185	3.641	0.000
R&D Ratio <- Innovativeness	0.721	0.635	0.332	2.168	0.031
Retw_Perc <- Success SM	0.560	0.378	0.275	2.039	0.042
Tw_Likes <- Success SM	0.287	0.431	0.321	0.897	0.370
Tw_UsageRatio <- Speed SM	0.526	0.492	0.236	2.232	0.026
Tw_follower <- Success SM	0.694	0.517	0.367	1.891	0.059
Tw_hashtags <- Success SM	0.364	0.255	0.234	1.555	0.121
Tweets_day <- Scope SM	0.672	0.620	0.184	3.654	0.000
Yt_Subscr <- Success SM	0.720	0.528	0.399	1.804	0.072
Yt_UsageRatio <- Speed SM	0.791	0.694	0.228	3.468	0.001
Yt_Videos <- Scope SM	0.715	0.663	0.231	3.096	0.002
Yt_views <- Success SM	0.812	0.533	0.386	2.103	0.036

Outer Weights

Mean, STDEV, T-Values, P-Values

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
Channels_adopt <- Scope SM	0.620	0.507	0.205	3.026	0.003
Fb_Comments <- Success SM	0.066	0.039	0.119	0.558	0.577
Fb_Followers <- Success SM	0.023	0.036	0.108	0.212	0.832
Fb_Posts <- Scope SM	0.180	0.169	0.212	0.850	0.396
Fb_ReactPost <- Success SM	0.142	0.106	0.074	1.906	0.057
Fb_SharesPost <- Success SM	0.146	0.104	0.097	1.506	0.133
Fb_UsageRatio <- Speed SM	0.395	0.357	0.204	1.932	0.054
In_Followers <- Success SM	-0.384	-0.175	0.262	1.467	0.143
In_Posts <- Scope SM	-0.084	-0.090	0.269	0.312	0.755
In_UsageRatio <- Speed SM	0.419	0.427	0.196	2.137	0.033
Innov_Coop <- Innovativeness	0.574	0.507	0.295	1.943	0.053
PatentApp_2015 <- Innovativeness	0.295	0.313	0.147	2.014	0.044
R&D Ratio <- Innovativeness	0.514	0.405	0.257	2.001	0.046
Retw_Perc <- Success SM	0.272	0.177	0.199	1.365	0.173
Tw_Likes <- Success SM	0.169	0.223	0.217	0.780	0.436
Tw_UsageRatio <- Speed SM	0.224	0.226	0.197	1.135	0.257
Tw_follower <- Success SM	0.056	0.068	0.096	0.586	0.558
Tw_hashtags <- Success SM	0.081	0.081	0.149	0.541	0.589
Tweets_day <- Scope SM	0.280	0.247	0.110	2.544	0.011
Yt_Subscr <- Success SM	0.185	0.135	0.173	1.071	0.285
Yt_UsageRatio <- Speed SM	0.492	0.408	0.217	2.272	0.024
Yt_Videos <- Scope SM	0.406	0.380	0.175	2.327	0.020
Yt_views <- Success SM	0.132	0.081	0.075	1.763	0.078

Appendix 9.2 – Sustainability Only

Path Coefficients

Mean, STDEV, T-Values, P-Values

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
SO -> Scope of SM	0.532	0.547	0.124	4.296	0.000
SO -> Speed of SM	0.299	0.360	0.151	1.984	0.048
SO -> Success of SM	0.370	0.383	0.125	2.949	0.003

R Square

	R Square	R Square Adjusted
Scope of SM	0.307	0.292
Speed of SM	0.091	0.072
Success of SM	0.186	0.170

Discriminant Validity

Fornell-Larcker Criterion

	SO	Scope of SM	Speed of SM	Success of SM
SO	1.000			
Scope of SM	0.554	0.616		
Speed of SM	0.302	0.715	0.637	
Success of SM	0.432	0.388	0.312	0.658

Collinearity Statistics (VIF)

Outer VIF Values

	VIF
Channels_adopt	1.206
Fb_Comments	-4.745
Fb_Followers	-2.747
Fb_Posts	2.432
Fb_ReactPost	-250.582
Fb_SharesPost	-218.698
Fb_UsageRatio	1.069
In_Followers	-0.620
In_Posts	6.775
In_UsageRatio	1.114
Retw_Perc	1.409
Sust_Rating	1.000
Tw_Likes	-1.883
Tw_UsageRatio	1.188
Tw_follower	-12.443
Tw_hashtags	1.330
Tweets_day	1.769
Yt_Subscr	-21.334
Yt_UsageRatio	1.349
Yt_Videos	5.818
Yt_views	-44.562

Outer Loadings

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
Channels_adopt <- Scope of SM	0.842	0.787	0.157	5.358	0.000
Fb_Comments <- Success of SM	0.388	0.396	0.321	1.208	0.228
Fb_Followers <- Success of SM	0.469	0.495	0.213	2.198	0.028
Fb_Posts <- Scope of SM	0.204	0.193	0.289	0.704	0.482
Fb_ReactPost <- Success of SM	0.724	0.716	0.177	4.080	0.000
Fb_SharesPost <- Success of SM	0.648	0.653	0.191	3.400	0.001
Fb_UsageRatio <- Speed of SM	0.693	0.601	0.257	2.693	0.007
In_Followers <- Success of SM	-0.448	0.016	0.700	0.640	0.522
In_Posts <- Scope of SM	0.485	0.457	0.241	2.010	0.045
In_UsageRatio <- Speed of SM	0.430	0.383	0.392	1.097	0.273
Retw_Perc <- Success of SM	0.711	0.631	0.166	4.291	0.000
Sust_Rating <- SO	1.000	1.000	0.000		
Tw_Likes <- Success of SM	0.385	0.430	0.133	2.901	0.004
Tw_UsageRatio <- Speed of SM	0.672	0.550	0.297	2.260	0.024
Tw_follower <- Success of SM	0.660	0.638	0.177	3.719	0.000
Tw_hashtags <- Success of SM	0.391	0.328	0.225	1.742	0.082
Tweets_day <- Scope of SM	0.591	0.559	0.158	3.747	0.000
Yt_Subscr <- Success of SM	0.533	0.511	0.203	2.622	0.009
Yt_UsageRatio <- Speed of SM	0.686	0.530	0.299	2.291	0.022
Yt_Videos <- Scope of SM	0.645	0.615	0.154	4.191	0.000
Yt_views <- Success of SM	0.669	0.598	0.263	2.542	0.011

Outer Weights

Mean, STDEV, T-Values, P-Values

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
Channels_adopt <- Scope of SM	0.726	0.668	0.177	4.109	0.000
Fb_Comments <- Success of SM	0.025	0.040	0.116	0.219	0.827
Fb_Followers <- Success of SM	0.103	0.086	0.035	2.943	0.003
Fb_Posts <- Scope of SM	-0.067	-0.090	0.197	0.337	0.736
Fb_ReactPost <- Success of SM	0.108	0.102	0.041	2.666	0.008
Fb_SharesPost <- Success of SM	0.084	0.088	0.043	1.969	0.050
Fb_UsageRatio <- Speed of SM	0.543	0.450	0.265	2.048	0.041
In_Followers <- Success of SM	-0.443	-0.237	0.268	1.655	0.099
In_Posts <- Scope of SM	0.042	0.041	0.163	0.256	0.798
In_UsageRatio <- Speed of SM	0.252	0.251	0.323	0.780	0.436
Retw_Perc <- Success of SM	0.463	0.389	0.123	3.752	0.000
Sust_Rating <- SO	1.000	1.000	0.000		
Tw_Likes <- Success of SM	0.250	0.231	0.070	3.568	0.000
Tw_UsageRatio <- Speed of SM	0.438	0.339	0.282	1.554	0.121
Tw_follower <- Success of SM	0.107	0.100	0.049	2.192	0.029
Tw_hashtags <- Success of SM	0.046	0.028	0.137	0.339	0.735
Tweets_day <- Scope of SM	0.280	0.266	0.078	3.605	0.000
Yt_Subscr <- Success of SM	0.112	0.111	0.044	2.553	0.011
Yt_UsageRatio <- Speed of SM	0.312	0.212	0.277	1.127	0.260
Yt_Videos <- Scope of SM	0.298	0.271	0.095	3.131	0.002
Yt_views <- Success of SM	0.035	0.016	0.127	0.275	0.784